The Electrical Industry's Weekly Magazine

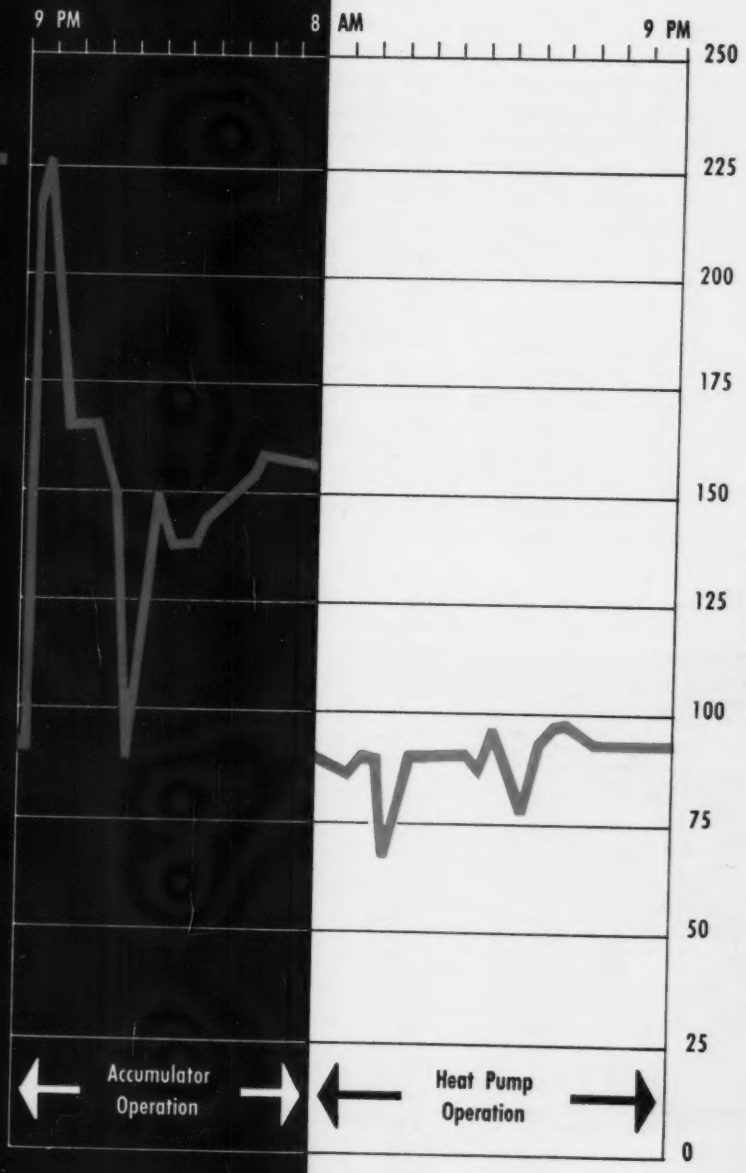
# Electrical World

March 21, 1960

A McGraw-Hill Publication

Price 50 Cents

# Western Mass. Electric Tests Commercial Off-Peak Heat Storage In New HQ...

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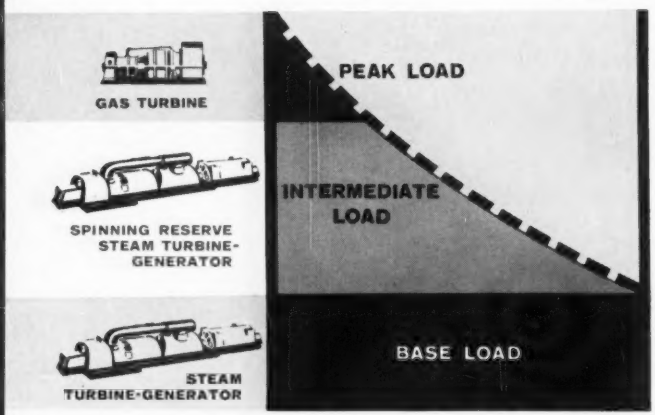
# SPINNING RESERVE . . .




**SPINNING RESERVE** turbine-generators are most suitable for use between short-term peak and continuous base loads.

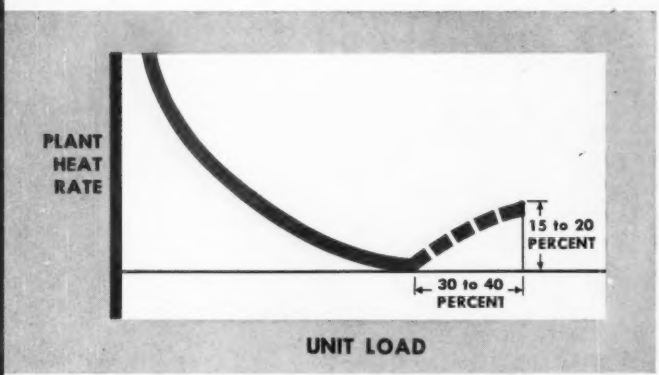
**TO HELP KEEP THE COST OF POWER LOW** General Electric, with the support and encouragement of its electric utility customers, has traditionally led the way in developing and applying new concepts in power generation.

**BASE LOAD** generation costs have been steadily decreased through General Electric's pioneering achievements in increasing the capacity and efficiency of generating units.

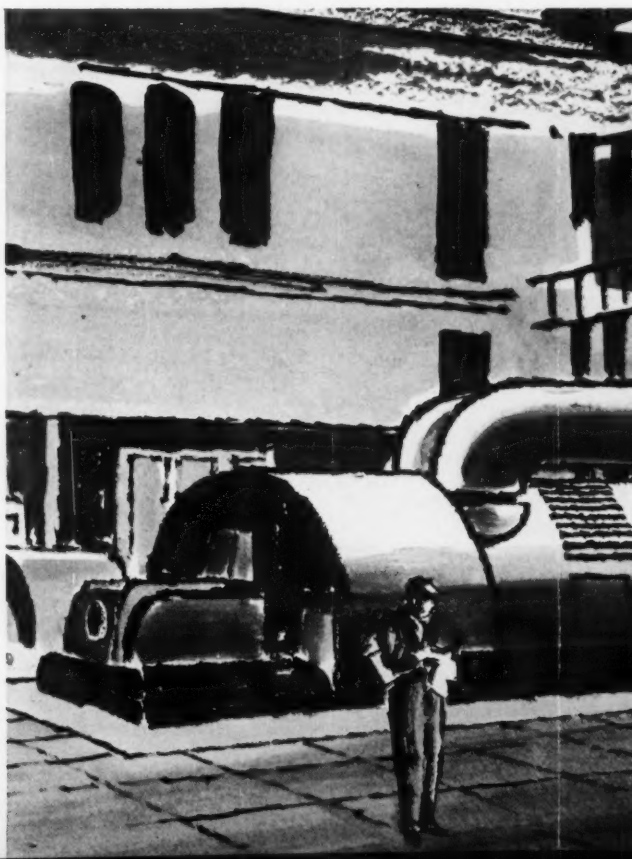
**PEAK LOAD REQUIREMENTS** can now be met economically by gas turbines with both low installed cost and low operating and maintenance costs.

**INTERMEDIATE LOAD-DURATION** studies by General Electric have recently resulted in a new concept in turbine-generator design: Spinning Reserve.

**SPINNING RESERVE** describes a base load unit with low-cost added capacity for patterns of daily maximum load demand which are found on most systems. Units now being developed point the way towards lower initial plant investment.




**PROGRESS IN MATERIALS AND DESIGNS** now makes possible outputs 30 to 40 percent greater than those established by optimum efficiency.



# a new concept in turbine-generator design

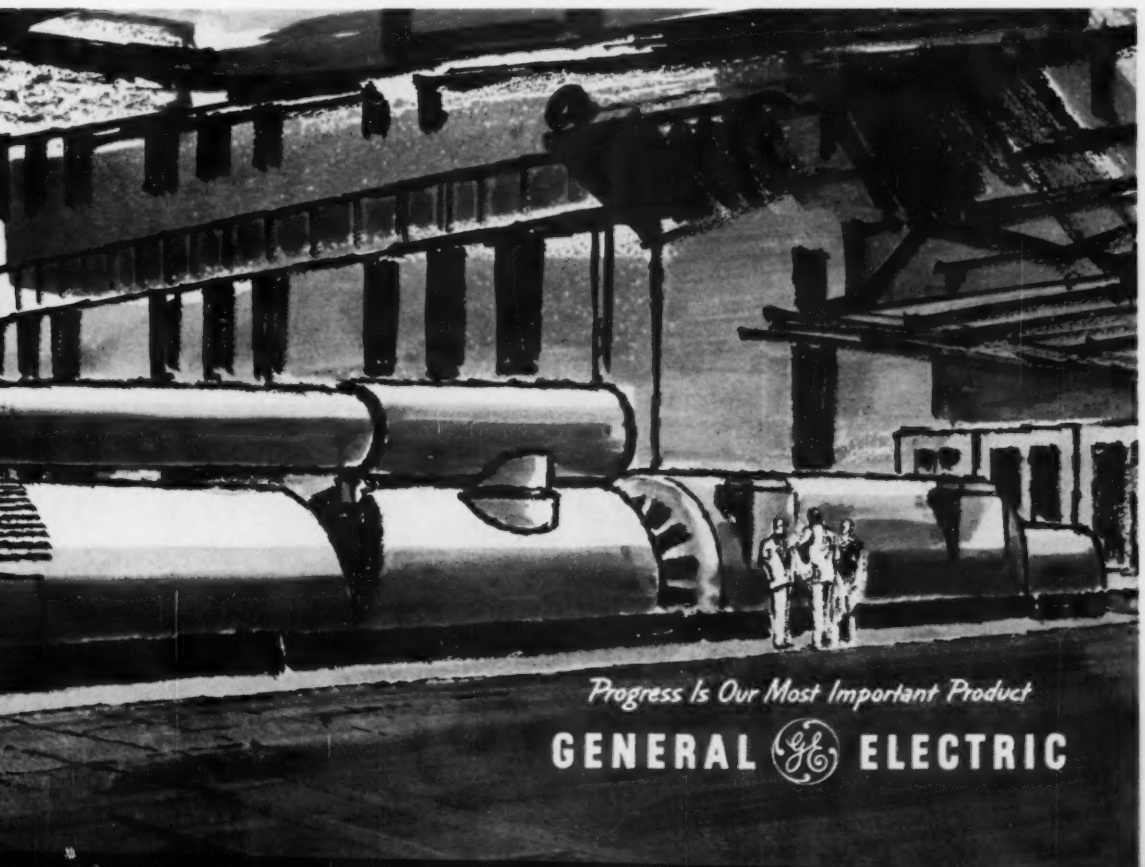
**A NEW TYPE OF UNIT,** the Spinning Reserve turbine-generator is a high-efficiency base load generating unit with an added good-efficiency, short-time capacity that can be used during the period of maximum daily load demand. Base load unit as used here means a unit that, due to its high efficiency, will normally be operated under incremental loading at high load factor.

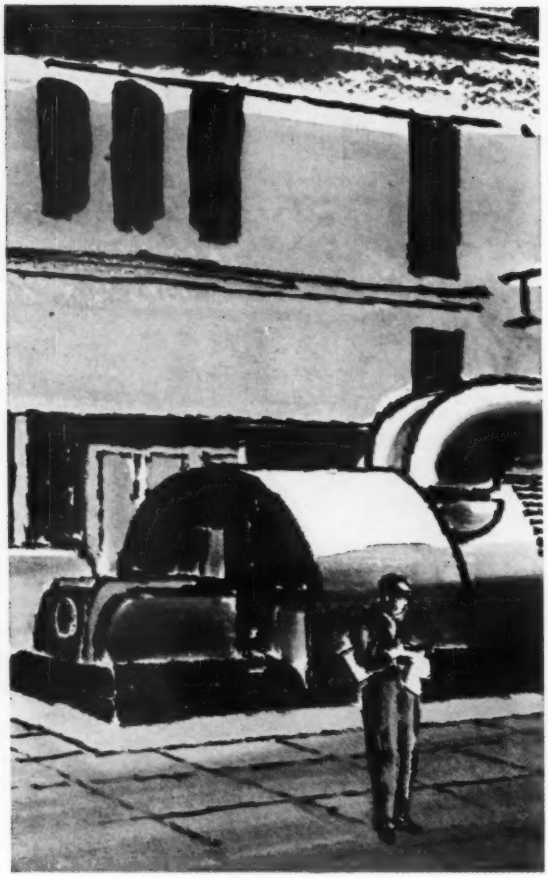
Spinning Reserve installations are more expensive, but more efficient, than gas turbine units. They are less expensive, but also less efficient at maximum output, than base load generating installations. For this reason, Spinning Reserve turbine-generators are most suitable for use between short-term peak and continuous base loads.

**INVESTMENT SAVINGS IN SPINNING RESERVE** units are realized because turbine-generators designed for optimum efficiency at base load capacity can now be built strong enough to deliver an additional 30 to 40 percent more power with a plant heat rate only 15 to 20 percent poorer than the base. Studies now being made by several electric utilities indicate that comparable additional short-time capacity may be obtained by overfiring the boiler and by using the spare capacity usually available in the plant auxiliaries.

**FOR MORE INFORMATION** on this new approach, write for a copy of GER-1654, "Large Steam Turbine-Generators with Spinning Reserve Capacity." General Electric Co., Section 301–413, Schenectady 5, N. Y.

**SPINNING RESERVE TURBINE-GENERATORS ARE BASE LOAD UNITS WITH LOW-COST ADDED CAPACITY.**





General Electric reports on . . .

# SPINNING RESERVE a new approach to lower generating costs

# Electrical World

Vol. 153, No. 12 MARCH 21, 1960

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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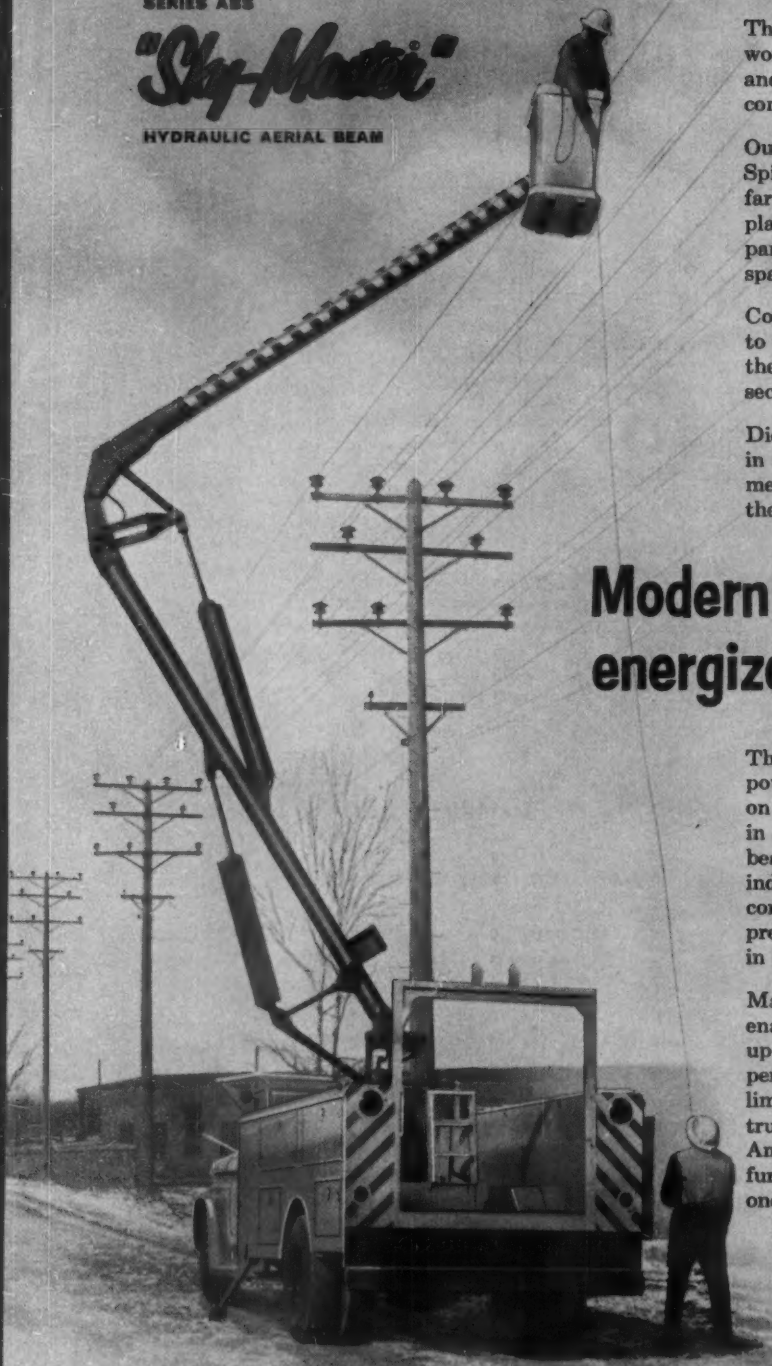
SERIES ABS

"Sky-Master"

HYDRAULIC AERIAL BEAM



That's right, with the Series ABS Sky-Master workmen can reach out-of-the-way areas quickly and work on or near energized phase lines in complete safety.

Outer beam of the Series ABS is an extra-strong Spirex tube which withstands dielectric testing far in excess of normal requirements. Reinforced plastic work basket has no current-conducting parts or projections . . . provides ample work space and toe room for the operator.

Control levers beside work basket are connected to those on the mast by direct linkage, giving the operator a positive "feel" not possible with secondary hydraulic control-actuating systems.

Dielectric, reinforced plastic rods are installed in the control linkage and basket leveling mechanisms to electrically isolate the basket from the ground.

# Modern way to work on energized high voltage lines

The Series ABS is fully-hydraulic in operation, powered by a pump driven by a power take-off on the truck transmission. Outer beam movement in an operating arc of 270 degrees and inner beam movement through a 110-degree arc is independently controlled. Mast can be rotated continuously in either direction. Safety devices prevent unwanted movement when controls are in neutral or if hydraulic system is damaged.

Maximum ground-to-basket floor height is 42'—enabling men to work safely and without fatigue up to 47' above ground. Wide range of operation permits spotting of the work basket in limitless positions in any direction from the truck. The Series ABS, installed on a Powers-American Body that fits your work needs, can be furnished in two models; Series ABS-1-42 having one basket, Series ABS-2-42 with two baskets.

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# LETTERS

## Cooperation on Farm Sales Front

To the Editor:

Editorial writers are supposed to have their heads in the clouds, but EW is a notable exception! Your lead editorial in the Feb. 22 issue makes a down-to-earth suggestion on inter-industry cooperation for farm sales promotion.

While it is an objective of the Inter-Industry Farm Electric Utilization Council to foster greater cooperation between cooperatives and companies at the local level, we have not worked too hard at it. Individual state councils, notably Arkansas, Illinois, and Pennsylvania are working toward local programs. To encourage this, we plan to stress grassroots activities in our seventh annual National Electric Farm Power Conference, Sept. 21-23, 1960, in Louisville, Ky. . . .

In the American, and electrical industry, tradition, 1960 must show improvement. Your suggestion toward that end will be welcomed. Again, our sincere appreciation for your excellent editorial.

Ralph J. Foreman, chairman
Inter-Industry Farm Electric Utilization Council, Inc
P. O. Box 577
Washington 4, D. C.

▶Mr. Foreman is also deputy administrator, Rural Electrification Administration.

To the Editor:

Noted with a great deal of interest your editorial in the February 22nd issue. . . . If there would be perhaps more of the same sort of program in other states we wonder if perhaps this might be a step in the right direction in establishing a different type of trend in our industry. . . . Was very gratifying to see such an editorial and we thank you for the opinion you expressed.

Harlan E. Ruback, manager
Top O'Michigan Rural Electric Co
Boyne City, Mich.

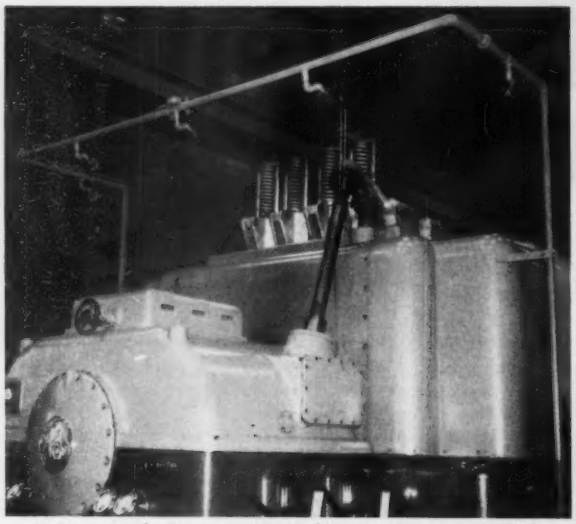
To the Editor:

As a director of the Inter-Industry Farm Electric Utilization Council, Inc, I wish to express my appreciation to you for your lead editorial of February 22.

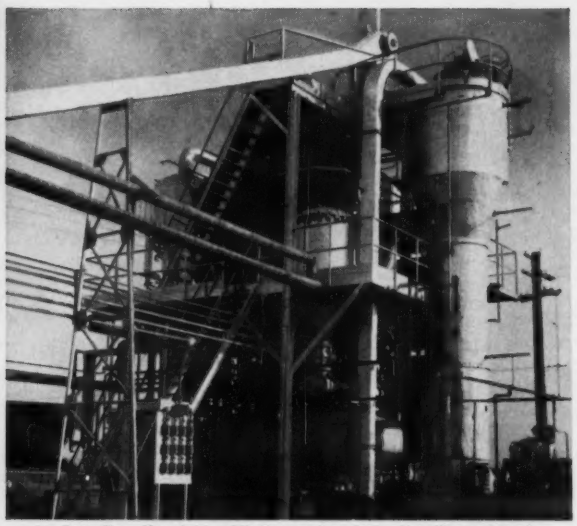
I hope that your suggestions will be taken seriously by management of both types of utilities. In most areas of the Nation an excellent job is being done with respect to cooperation on "white goods" promotions. But few utilities are doing a good job on the farm front; and in quite a few states there is very little cooperation in efforts to sell the farm equipment market.

Our larger farms now use 50,000 kwhr per year and have a very large investment in electric farm

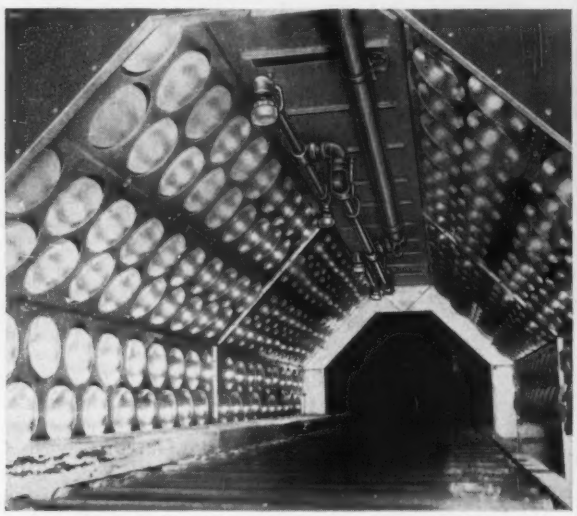
(*Continued on page* 141)



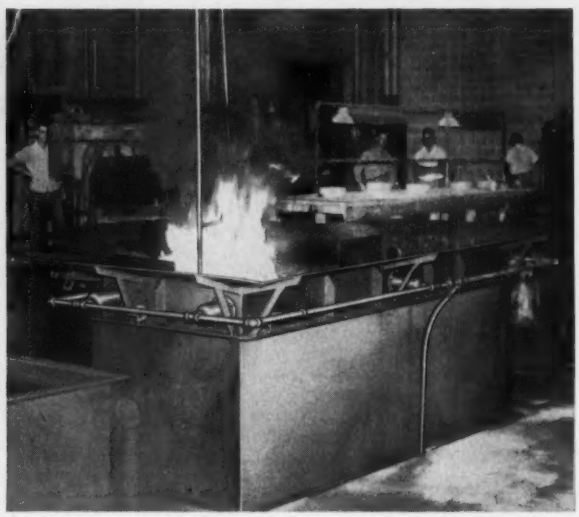
**At Pennsylvania Power and Light Company,** Sunbury, Pa., this steam generator is protected by an automatic Grinnell Protecto-Spray system in the event of outside fires and by a Dry Chemical system inside the casing.



**At Canadian Vegetable Oil Processing Ltd.,** Hamilton, Ontario, Grinnell ProtectoSpray safeguards upper structure of this hexane solvent extraction unit, while a ProtectoFoam system guards the lower section.



**At the RCAF supply depot** at Namao, Alberta, this infrared drying oven is protected by a Dry Chemical system engineered by Grinnell to protect against possible fire resulting from ignition of flammable vapor mixtures.



**At Dresser Industries, Inc.,** Dallas, Texas, hot metal temporarily ignites resulting vapors as metal is being submerged. If fire should get out of control, a Grinnell-installed Carbon Dioxide system is on guard to extinguish it quickly.

# You can rely on Grinnell for the right protection against destruction by fire!

Grinnell has had 90 years experience in devising fire protection systems for all kinds of fire hazards — systems which can be relied on to protect the continuity of your business and to safeguard your dollar investment. Grinnell offers you quality-controlled manufacturing, layouts by experienced engineers, and installations by skilled crews. Let Grinnell engineers help you select the right system.

**16 mm. Sound-Color Film**—Get up to date on fire with Grinnell's 35-minute film — "Fire Protection Through Research." Both typical and unusual fire hazards are described and demonstrated. To borrow this film, without charge, write — Grinnell Company, Providence 1, Rhode Island.

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Need wire cutters? Pin type insulators? Guy strand? An electric impact wrench? Whether for day-to-day use or emergencies, Graybar can deliver everything you need for line maintenance — from eye bolts to completely pre-assembled fifty-foot double plank transmission crossarms.

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Plotting a new subdivision? Planning a new shopping center? Reworking, modernizing a distribution system? Write Wagner Sub-Urban Pad Mounted Transformers into your standards.

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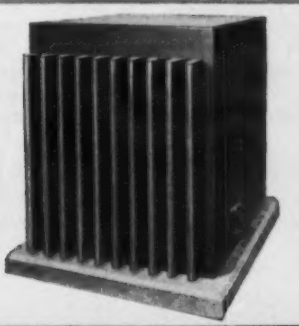
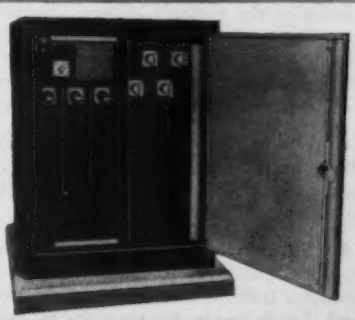
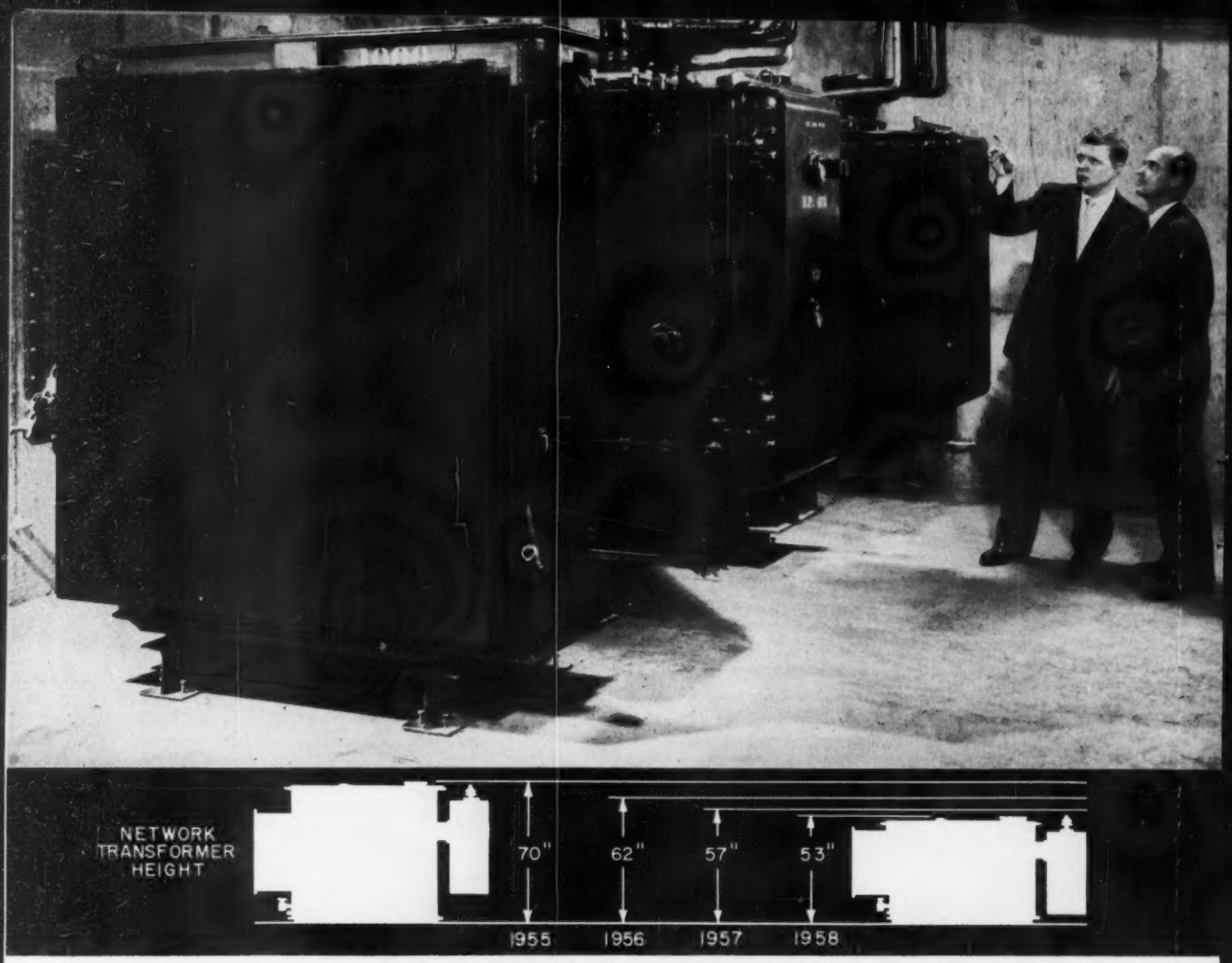
**SINGLE-PHASE**—Terminal cabinet of a 100 Kva single-phase transformer. Barrier plates are provided between high voltage bushings and between high and low voltage compartments. Single-phase ratings from 25 through 167 Kva.

**THREE-PHASE**—Terminal cabinet of a 225 Kva three-phase Sub-Urban Transformer. High voltage tap changer is at the left side of the nameplate. Three-phase pad units are available in ratings from 75 through 500 Kva.








Utility and G-E engineers inspect recent Vaultmaster transformer installation. Insert shows dramatic size reductions—totalling 24%—made on 500-kva, 15-kv network transformer since 1955.

# General Electric network transformers combine new features, old reliability to pace utility requirements

Not by tradition alone has the General Electric network transformer held its unquestioned rating as the No. 1 choice of the nation's electric utilities. Utilities know that *continuous* design innovations—backed by in-service reliability—keep the G-E "Vaultmaster" ahead of the field. For example, look at these major improvements made to G-E network transformers in the past 18 months:

- **Wound Evans Core** (July, 1958)—This important development utilizes the famous G-E Spirakore* core and results in a core-and-coil that has improved characteristics, yet is smaller and lighter.

- **"Sandwich" Paint Finish** (October, 1958) Melaprene, the best paint yet found to combat corrosion damage to network transformer finish, is applied *between* the primer and finish coats to provide extra-long finish life—altogether, five paint coatings are applied compared to three coats on other network transformers.

- **Alumina Bushings** (March, 1959)—The goal of a hermetically sealed network transformer was brought one step closer with this major advance. It eliminates the need for gaskets while reducing the throat height of the Vaultmaster unit by four to six inches.

- **Nitrile Gaskets** (November, 1959)—Both the high- and low-voltage ends of G-E network transformers are now protected by nitrile rubber gaskets—superior in sealing ability and reusable without requiring cement or other adhesive.

Thinking of a network installation this year? If so, be sure you have kept up with network-transformer advancements by keeping in touch with your General Electric Sales Engineer. Or, write for Bulletin GEA-5024 to Section 484-01, General Electric Co., Schenectady 5, N. Y.

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GENERAL ELECTRIC

# The Electrical Week

**LATE NEWS** ▶ **Three models of a new electric car will be unveiled this week at the** Southeastern Electric Exchange meeting in Boca Raton, Fla. Using a European small car body and an improved control system, the cars are built by a company with long experience in the electrical and automotive fields.

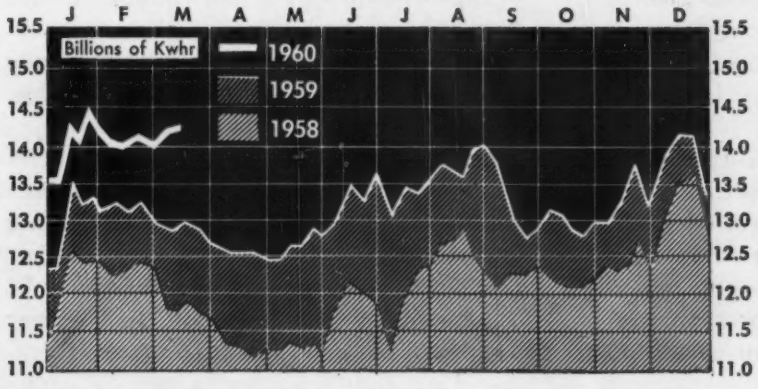
**Around the States** . . . Texas begins paying cities and private utilities for relocating their facilities because of highways. Tab will come to $28 million . . . Colorado Supreme Court reverses decision of state PUC. In a 4-2 decision, it restricts REA co-op and gives service rights for Denver suburbs to two private utilities . . . 1959 financial statistics for Hawaiian Electric reflect prosperity in the newest state. Example: Plant capability—up 17.6%; Peak load—up 15.9%; Kwhr sales—up 14.2%; Revenues—up 7.6% . . . South Carolina legislature passes resolution opposing further public power development of Savannah River . . . Kentucky Gov Combs signs bill giving electric utilities right to continue serving areas annexed by cities.

**Washington Wire** . . . House Commerce Committee approves revised version of bill (HR-7201) to permit coordinated hydro power operations in river basins. Similar Senate bill has not been approved by Senate committee . . . AEC grants $2.3-million extension of contract with Martin Co for work on isotopic power. Extension is outgrowth of earlier programs that resulted in SNAP (Systems for Nuclear Auxiliary Power) units.

**Westinghouse breaks ground on new R&D lab** near Pittsburgh. This will double facilities of lab built in 1956.

**Management changes** . . . E. C. Bower becomes president of Merrimack-Essex Electric Co . . . J. I. Mailer is promoted to vp at Oklahoma G&E.

## *WEEKLY POWER OUTPUT*—Up 9.8% (Week ending Mar. 12), Kwhr 14,271,000,000




Per Cent Change From Previous Year

| | Feb. 27 | Mar. 5 | Mar. 12 |
|---|---|---|---|
| Total U. S. | + 8.6 | +10.2 | + 9.8 |
| New Eng. | + 3.3 | + 5.3 | + 5.6 |
| Mid. Atlan. | + 7.2 | + 9.2 | + 8.3 |
| Cent. Ind. | + 8.5 | + 9.0 | + 8.3 |
| West Cent. | + 8.3 | + 9.4 | + 9.9 |
| Southeast | + 9.8 | +10.5 | +12.5 |
| South Cent. | + 9.8 | +11.0 | +10.4 |
| Rocky Mount | + 9.4 | +15.2 | + 8.8 |
| Pacific | | | |
| NW | + 6.4 | +13.7 | +12.7 |
| SW | +12.3 | +10.5 | +10.3 |

Seasonally Adjusted Index 276.6

Week Ago 276.1 Year Ago 251.4

Source: Edison Electric Institute

# Preview of This Issue

**EVENTS** **Western Democrats have merged power and natural resources** in a plank which they hope will be used in coming Presidential election. Utah P&L's Naughton attacks it, comparing to Socialists' program of 1920's **(p 66)** . . . "202" hearings round out first week; Shippingport may get $4-million heat sink, Hanford 700,000 kw of capacity **(p 67)** . . . Siemens Electric (W. Germany) grants Mexico $50-million power loan **(p 67)** . . . PUD's cloud PNP's Mountain Sheep proposal with one for Nez Perce **(p 68)** . . . Dresden A-plant loading fuel after two bad starts **(p 69)** . . . Electric power plays an ever-widening role in South Africa **(p 70)** . . . Arraignments in federal anti-trust cases against electrical manufacturers **(p 72).**

**ENGINEERING** ▶ **Potomac Electric is using river intake in circulating water scheme** for its Dickerson Station. The river water is being extended from Unit 1 to Unit 2; however, subsequent units may need cooling towers also **(p 75)** . . . Western Massachusetts Electric Co is using its new system headquarters to evaluate off-peak heat storage and heat pump costs **(p 77)** . . . The Teinograph is a new device, now being tested, which depicts the wave shape of lightning stroke currents to towers **(p 80)** . . . Mobile substation tolerates heavy loading at unattended locations **(p 73).**

# Politics and Public Power

### ELECTIONS AND THE PUBLIC PREFERENCE

"Continuing the trend established in previous years, private enterprise won 11 of the 16 elections in 1959, where people had an opportunity to vote directly on the issue of company-vs-government ownership of electric power."

Thus begins a report on public ownership elections in 1959 prepared for the Electric Companies Public Information Program (PIP) by Central Surveys, Inc, of Shenandoah, Iowa.

The report goes on to document the trend by pointing out that in the entire 14-year period (1946-1959), the ratio of elections "won", i.e., favoring the investor-owned companies, to those lost has been roughly two to one. "For the 14-year period, the companies have won 166 times, government ownership 90 times." The precise ratio is 1.85 to one.

In 1959 the ratio was continued. Last year, out of a total of 16 elections, the companies came up with a favorable vote 11 times; in five elections the vote went against them.

These elections can be broken down into two categories:

- Those involving proposals to establish or expand municipal or other publicly-owned systems in company-served areas; and
- Those involving proposals for companies to buy or lease municipal or other publicly-owned systems, co-ops, etc.

In the first group, the companies, out of 144 elections in 14 years, have won 95 times and lost 49. In 1959 (included in the total), out of five contests they won four and lost one. In the second category, they won 71 contests out of 112, losing 41. In '59, they won seven out of 11, giving up four.

**PROCUREMENT & PRODUCTS** ▶ **Public utilities plan to boost capital spending 9% over '59** . . . Groundwork for GE and Westinghouse labor negotiations is being laid . . . Copper retreats toward 33¢ a lb **(p 92)** . . . Conductors for Pennsylvania Electric's prototype 460-kv line are tested **(p 96)** . . . Gas turbine has NEMA rating of 9,000 bhp . . . Multiplex-carrier system can handle up to 600 voice-frequency channels . . . Distribution switchboard meets requirements through 5,000 amp **(p 104).**

**ELECTRICAL BUSINESS OUTLOOK** ▶ **Worried about the business outlook?** As a matter of fact, the 1960 upturn—much less lively than expected—may be a hopeful sign of underlying strength. So far, we haven't seen a speculative spree the likes of which produced the boom-and-bust cycles of the recent past. Instead, business is now building a base for a more sustainable growth through this year and next. Even at its present pace, 1960 should be a record breaker **(p 129).**

**SELLING** ▶ **Three case histories of successful utility wiring programs** were highlights of the 16th Annual Wiring Sales Conference **(p 125).**

**NEXT WEEK** ▶ **Read the first comprehensive report on electronic data processing** ever presented to the industry for accounting and other uses.

One interesting aspect of these elections is that they occurred in areas pretty well separated geographically. Although strictly local when considered individually, their composite results represent something more than that. Because of their wide separation they cannot be considered to represent a regional situation, but it may be that a good case could be made for them as a valid national sampling.

In any case, their results do not square very well with what government power proponents have been saying . . . about how the consuming public is being bilked by the private power companies. It would seem, on the basis of these election results at least, that the American public prefers the power industry to be privately run by about two to one.

However, it should be added that for a complete picture, the local issues in each of these elections during the past 14 years would have to be taken into consideration . . . a job which Central Surveys, in a great many cases, has done.

In looking over these records, a number of phrases keep recurring: "Refused to vote bond issue for municipal power plant . . ." "Voted to sell system to ABC power company . . ." etc. They appear to indicate that the public, when it comes to electric power supply, is much more interested in government economy than it is in ideology.

Another thing, not evident until one studies these election records in greater detail: Electric power, as a potential political issue, does not lie very near the surface of the public's consciousness.

On the other hand, when the public does give the matter some thought, these figures say it prefers to see the power business in private hands.

# Nuclear Notes

**Congressional hearings** to assess the proper role of the National Laboratories in atomic research probably will not get off the ground this session. Sen Clinton P. Anderson, chairman of the Joint Committee on Atomic Energy, is mindful of the political hornets' nest that could be stirred up by halting work now in progress by the National Laboratories and turning it over to the atomic industry. Moreover, influential members of the scientific community have rallied to support the seven major AEC National Laboratories as necessary R&D centers contributing services that private industry can't give now.

**Canadian GE is developing a new nuclear reactor** that uses a low-cost petroleum product instead of expensive heavy water to carry heat to the steam generator.

**Overseas** the move toward nuclear development steps up.

**Home British development advanced** with the request for bids to build 650-Mw Sizewell plant on the North Sea at a probable cost of $170 million. 400 men will be needed to run the plant after completion in 1965. Planning should start soon for the 1,000-Mw station on the west coast at Oldbury. This Advanced Gas Cooled Reactor, the prototype of which is under construction at Windscale, is a different type from those planned to date.

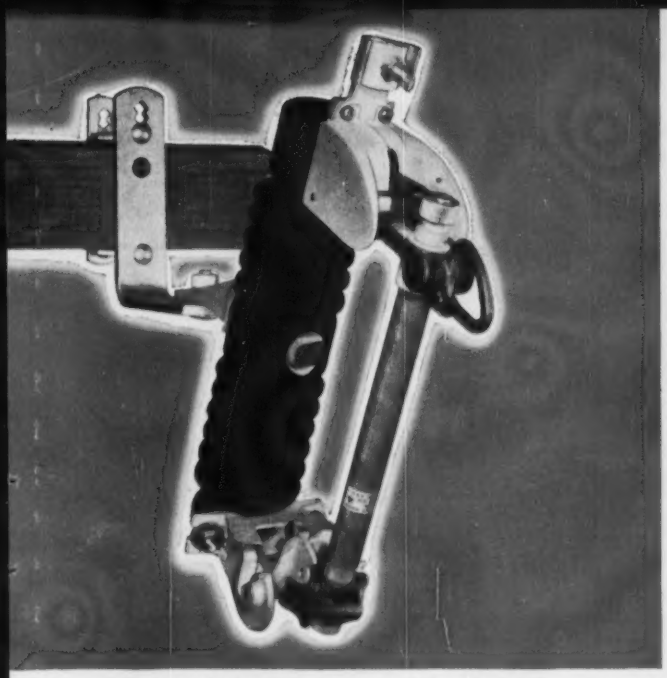
**Sweden and Austria, Hungary and Bulgaria** have also announced projected nuclear-powered generating plants. The 100-Mw Swedish installation on the Baltic will use natural uranium fuel and heavy water as coolant and moderator. The Austrians' tentative Alpine site has been sharply opposed by the nearby populace, which has identified the power reactor with the atomic bomb. Details from the two satellites are lacking.

**A proposal has been made to the Argentine government** to construct a 60,000 kw nuclear power plant near Buenos Aires, by the Mitchell Engineering Co, Ltd of Great Britain.

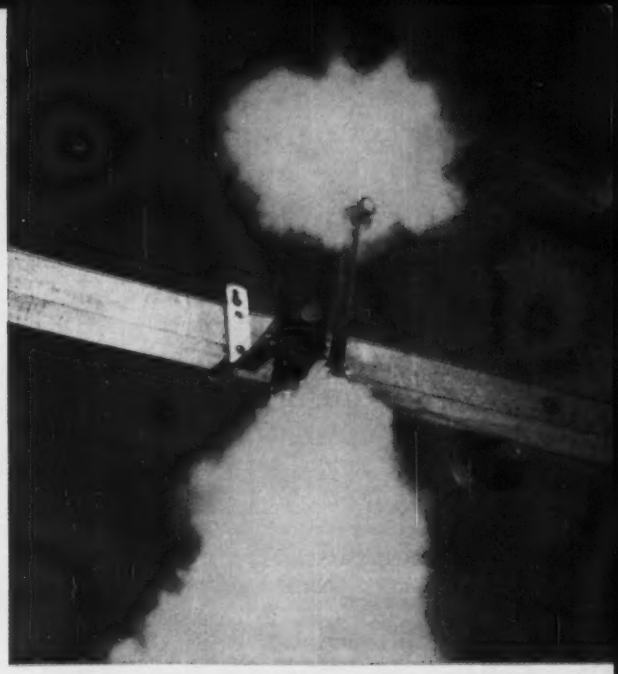
**The Soviet Union has already taken up industrial production of deuterium** from ordinary water and this created the prerequisite for large-scale fusion experiments, East Germany's daily "Freiheit" states.

**Cooling water need for a nuclear power plant** should not exceed that for a fossil fuel station in the next score years, according to a joint AEC-U.S. Geological Survey study for the Senate Select Committee on National Water Resources. They report further that waste disposal problems are not likely to affect significantly either water utilization or quality.

**New legal concepts** covering liability and compensation for injury from nuclear hazards are called for in **Atoms and the Law**, an extensive study by staff members of the University of Michigan Legislative Research Center.



**LINE MATERIAL** concentrates all engineering, testing and manufacturing efforts in one direction—*highest quality equipment for the electric power industry.* And L-M came to you to find what you wanted in the best possible open type fuse cutout. The New LMO incorporates every important feature you asked for.



**A 240,000 kva TEST** on a 15 kv 100 ampere Type LMO Distribution Cutout at L-M's Thomas A. Edison Short Circuit Laboratory. This cutout repeatedly interrupts 16,000 ampere faults. Many tests like this prove the LMO cutout *Totally Tested* under all possible operating conditions.

# This New Totally Tested Distribution Cutout Has All Features Electric Utilities Wanted

**Drawing upon its more than 35 years experience in the engineering, testing and manufacture of distribution fuse cutouts, L-M has produced the new Type LMO open type fuse cutout.**

Totally Tested in L-M's Thomas A. Edison Short Circuit Laboratory at Franksville, Wisconsin, with hundreds of tests, the new Type LMO has proved reliability, proved interrupting capacity and proved safety through its entire operating range.

The new Type LMO distribution fuse cutout has all the important features you asked for. Features heading the list:

1. Non-ferrous construction
2. Positive latching
3. High interrupting capacity
4. Rugged multiple contacts
5. Complete birdproofing
6. Choice of terminals—aluminum or bronze
7. Spring loaded interlocking flipper

**Get Complete Information.** Ask your Field Engineer to show you: the sample of the new Type LMO cutout; the Type LMO Bulletin No. FC3; the Type LMO Movie. Contact your L-M Field Engineer or write Line Material Industries, Milwaukee 1, Wis. In Canada: CLM Industries, McGraw-Edison (Canada) Ltd., Toronto 13, Can.

**TYPE LMO RATINGS**

| VOLTAGE RATING KV | CURRENT RATING AMPS | INTERRUPTING CAPACITY AMPERES—ASYMMETRICAL | | | |
|---|---|---|---|---|---|
| | | HEAVY-DUTY | | EXTRA-HEAVY-DUTY | |
| | | Non-Expendable Cap | Expendable Cap | Non-Expendable Cap | Expendable Cap |
| 7.8 | 100 | 5000 | 10000 | 10000 | 20000 |
| 15 | 100 | 4000 | 8000 | 8000 | 16000 |
| 27 | 100 | 3000 | 6000 | — | — |

Interchangeable Fuseholders: ratings may be changed simply by changing the fuseholder. Choice of heavy-duty or extra-heavy-duty fuseholders; 200-ampere disconnecting blade; link-break fuseholder. This interchangeability offers convenience and savings in labor, material, and stocking costs.

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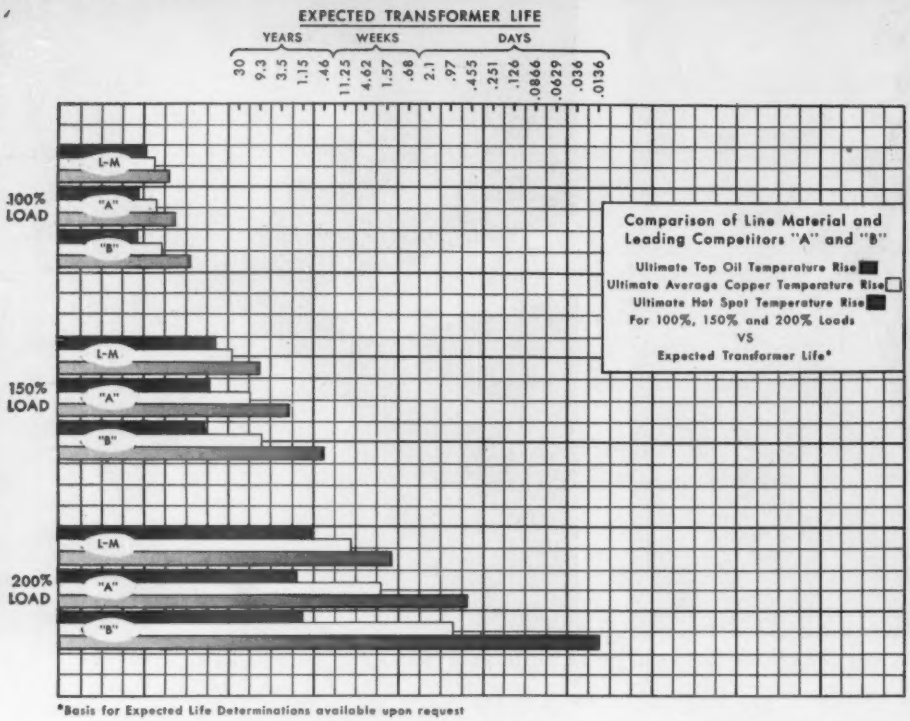
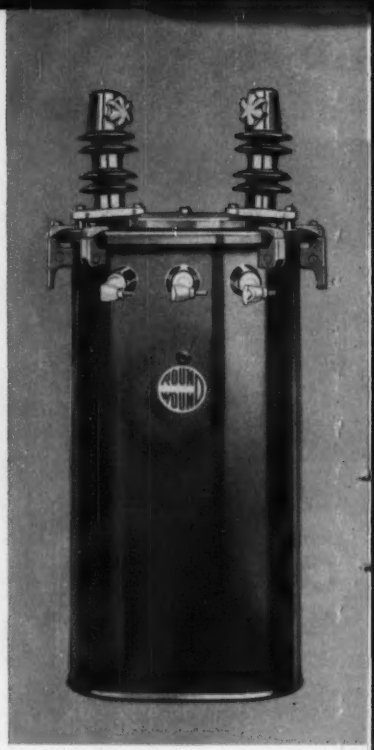


*Basis for Expected Life Determinations available upon request

**BASED ON AIEE TRANSACTION PAPER, "Life Expectancy of Oil Immersed Insulation Structures," volume 72, pages 924-29, and laboratory tests, transformer life can be estimated by comparing bar length with scale at top. (Note: the longer the bar, the shorter the life.)**

# L-M Increases Secondary Breaker Setting

## Low winding and insulation temperatures permit uprating L-M transformers without any sacrifice of transformer life expectancy.

by **A. R. WAEHNER**
Director
Transformer Product Sales
Line Material Industries

During the past year, much has been claimed about improved transformer insulating materials and systems. This has led to confusion and justified concern on the part of many users who are interested in the long life of distribution transformers.

The anticipated life of a transformer is not governed *solely* by the insulating materials used therein—but, just as importantly, by the temperatures at which they operate. The *design* of the core and coil structure that permits the *most rapid removal* of the heat generated within the winding results in the lowest insulation temperature.

Rapid extraction of heat from the vulnerable areas of the coil reduces the internal copper temperature that causes insulation deterioration, thereby extending life expectancy.

### High Top Oil Temperature

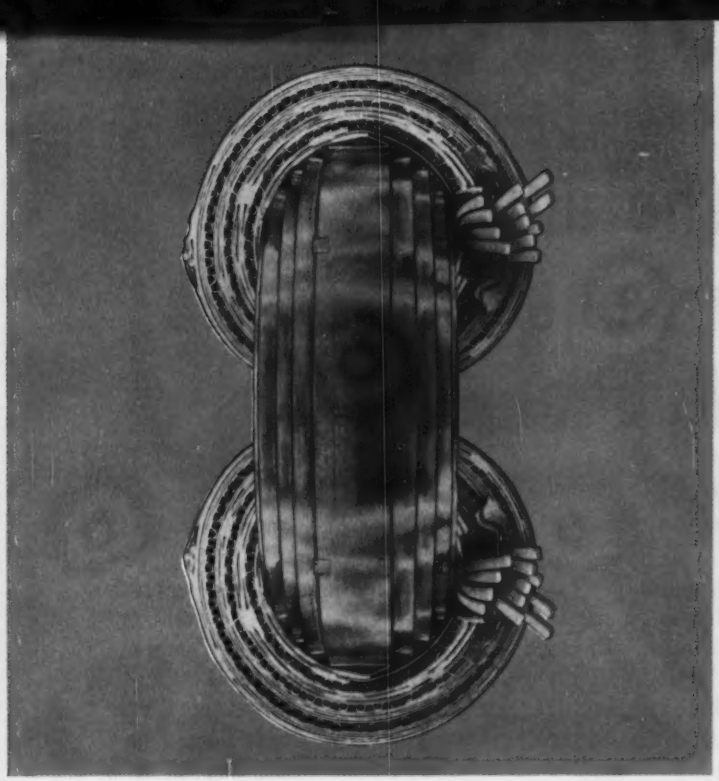
The inherent characteristics of the Line Material Round-Wound® design create *higher* top oil temperatures and lower copper temperatures than in other designs with the same total losses. This is an *advantage* and not a *disadvantage*, as it proves the rapid removal of internally generated heat. Just as hot beverages placed in a thermos jug cool slowly, in like manner other designs of cores and coils restrict the release of generated heat to a greater degree than in the Round-Wound design. Because we transfer heat to the oil more rapidly, the Round-Wound hot spot temperature is reduced, overload capacity is increased, insulation is not jeopardized, and life expectancy is extended.

Another advantage of higher top oil temperature is the more rapid dissipation of transformer heat because of the *higher* gradient between tank wall and ambient temperature of the surrounding atmosphere.

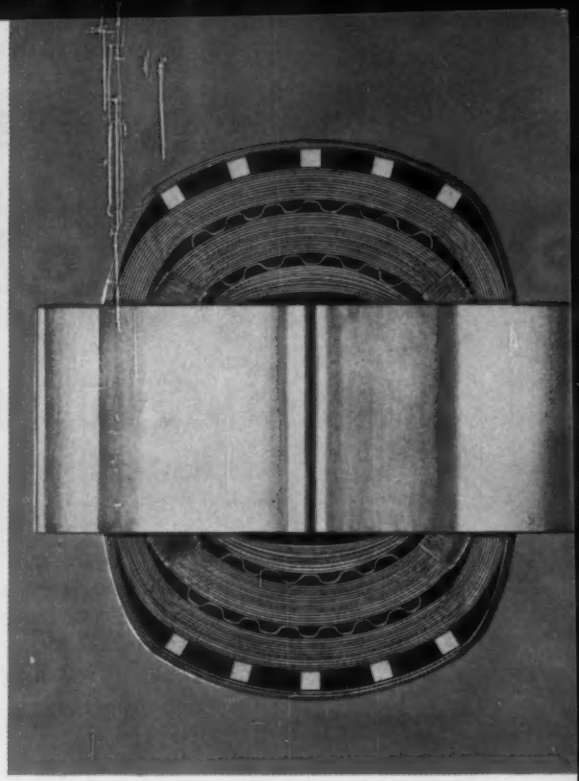
The illustrations on these pages clearly reveal a vastly greater percentage area of coil exposure to cooling oil than in competitive designs. Note, also, the many strategically located cooling ducts.

### Low Temperature Gradient

Fast heat transfer in a Round-Wound core and coil rapidly raises top oil temperature *closer* to the hot spot temperature. The degrees difference is known as "temperature gradient" and is lower in the Round-Wound design than in any other make of core or shell type transformer available today. Low temperature gradient is a most significant factor contributing to long transformer life,



**THIS END VIEW shows how L-M's exclusive Round-Wound design permits more oil ducts and exposes maximum cooling surface area. Winding heat is transferred more effectively than by other designs.**



**THIS END VIEW shows how shell type window dimension prohibit oil ducts on the inside where heat build-ups occu Only L-M's Round-Wound design provides concentric cooling**

# on Round-Wound-Protected Transformers

*especially* at times of heavy overload when transformers are most vulnerable to high insulation temperatures. To take the ideal condition, if the gradient were zero degrees, heat would transfer instantly, top oil temperature would be higher, hot spot temperature would be lower, and the ultimate in life expectancy would be attained.

Laboratory tests of modern competitive samples compared with the Round-Wound design prove conclusively that at periods of heavy overload, the Round-Wound hot spot temperature is lower than with any other modern competitive design. In fact, it is *less* than the average copper temperature of at least one leading make of transformer. This is dramatically revealed in C. R. Acker's technical article in the September-October, 1959 issue of THE LINE Magazine.

### Continuing Research

As a pioneer in long insulation life, Line Material, in 1951, was the first manufacturer to introduce oxidation resistant transformer oil (ORTO®). Our research and design engineers, with the assistance of Thomas A. Edison Laboratories, maintain a continuing search for improved insulation systems. If and when we find a better system, we will adopt it. The insulation system employed in the Round-Wound design, since its inception, is the finest available. The Round-Wound transformer you buy today will provide equal or greater life, under any comparable loading conditions, than any other transformer available in the industry today, *without* the necessity of a design change.

### Higher Secondary Breaker Settings

Throughout the years, our Round-Wound units have enjoyed liberal overload capacity with breaker settings in line with those dictated by the current usage in the industry. Our RWP® breaker settings have been recalibrated to be as high as or higher than those offered by any other major manufacturer today. Transformers with this new breaker calibration will be identified with this symbol ‡ following the Kva designation.

The same confidence in the longevity of Round-Wound conventional transformers may be expected because the core-and-coil designs are identical.

### Get Complete Information

Ask your L-M Field Engineer for the complete story on why the RWP transformer can have increased secondary breaker settings without a new design or without new insulation. Or write me at Line Material Industries, Milwaukee 1, Wisconsin.

**LINE MATERIAL Industries** *Transformers*

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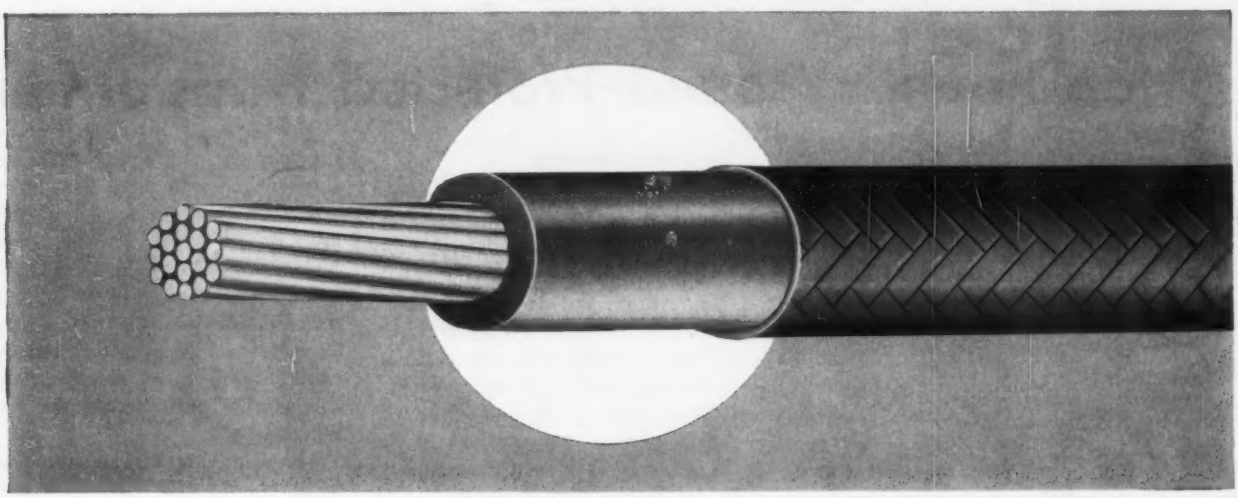
**Because it's what's over the conductor that counts**

# You need the advantages you get with General Electric Silicone Rubber Cables

A complete line of silicone rubber cables is available from General Electric, including power cables, control cables, generator leads, appliance and fixture wires, apparatus and motor leads, and heating cables. They have a voltage range of 300 volts to 35 kv, with conductor sizes up to 3500 MCM.

Consider the special advantages listed below of G-E extruded-type silicone rubber cables. Note particularly the improved type of silicone insulation. You'll also be interested in the moisture resistance and other benefits of G-E cables with heat-sealed taped jackets.

Both types of G-E silicone rubber cables are made from start to finish in General Electric's own plants. In fact, General Electric is the only wire and cable manufacturer that makes its own silicones. This is another reason why you can depend on G-E cables to meet your highest specifications for quality.

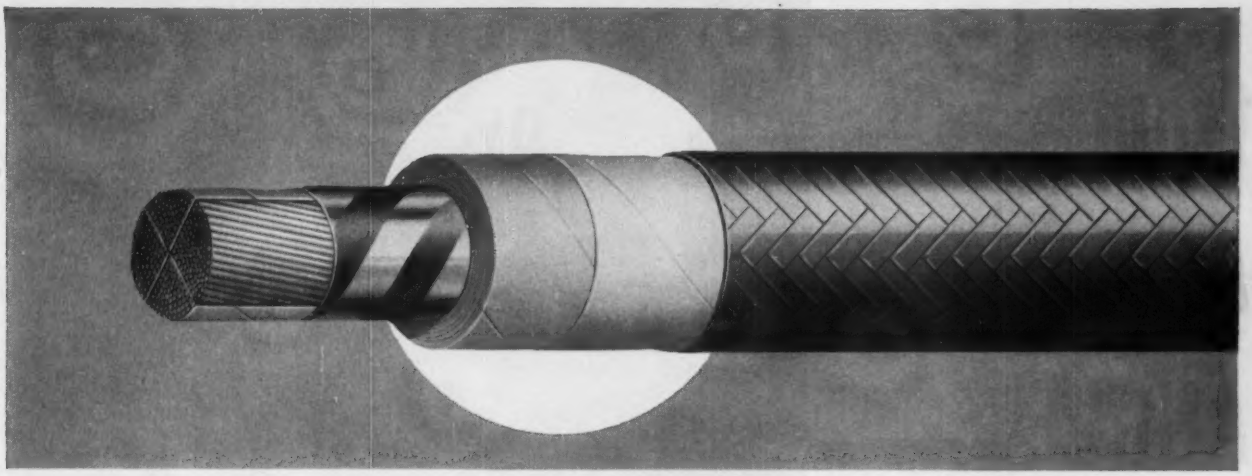


## NEW FEATURES ADDED TO G-E EXTRUDED-TYPE CABLES

General Electric's new improved type of silicone insulation, used on extruded-type insulated cables, has typical tensile strength and elongation of 1400 psi and 380% respectively. These are improvements over the values of 800 psi and 130% of the older type. Tear resistance is now 3 to 4 times greater than silicone rubber insulation formerly available.

G-E extruded-type silicone rubber cable is ideal for high-temperature services, where conductor temperature may reach 125 C under normal conditions, or even 200 C in special applications. Other features of extruded G-E silicone rubber cables include:

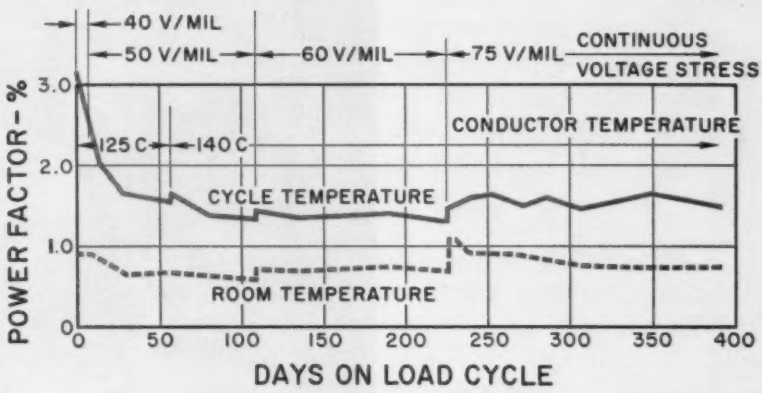
- low moisture absorption
- ozone resistance far exceeds that of other rubber compounds
- no shielding required up to 5 kv
- excellent low temperature characteristics meet IPCEA cold bend test at −55 C
- easy terminations—terminated and spliced in the same manner as any rubber cable, using silicone rubber splicing tapes.



## FEATURES OF G-E SILICONE RUBBER TAPED-TYPE CABLES

- excellent dielectric strength regardless of temperature or humidity
- low power factor (see chart)
- excellent ozone resistance
- higher current-carrying capacity. These cables carry loads where other types of cable require larger conductors or more conductors—an answer to the bottle-neck of duct size and temperature limitations.
- in addition, *new* heat-sealed taped jackets are available to provide moisture resistance at the high temperature at which these cables operate.

Load cycle overvoltage test on silicone rubber-coated glass taped cable 3 single conductor 2500 MCM 16/64" insulation, 4 temperature cycles per day.

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Wire and Cable Department
Section W243-327
Bridgeport 2, Conn.

Please send me complete information on G-E Silicone Rubber Cable.

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Company_____

Address_____

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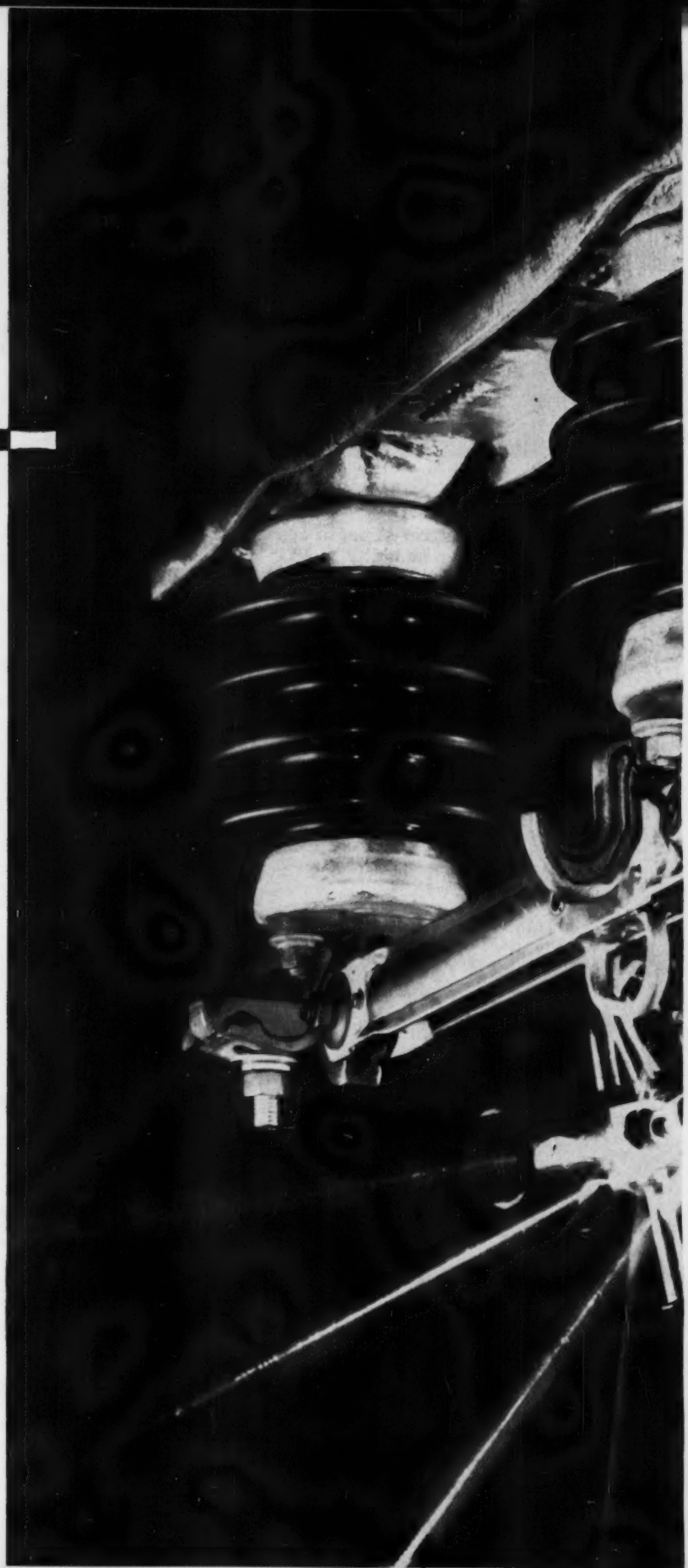
# from ANY ANGLE



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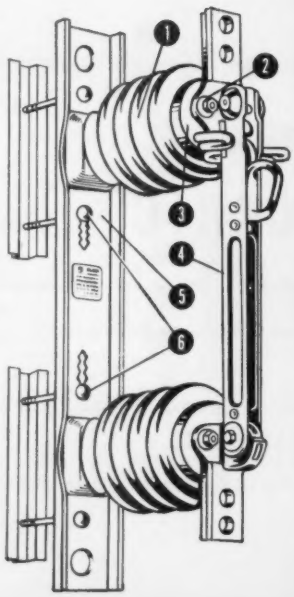
**RIGID BLADE** won't ınd. Heavy emboss- g and flaring adds rength and rigidity. ade guides (which so serve as attach- ent hooks for LOAD- JSTER) help steer ade.

**HUSKY BASE** made 3/16" galvanized eel. Prevents mis- ignment and exten- ve distortion when ghtening mounting lts.

**4 BOLTS, 2 BACK- PS** for secure, dis- rtion-free mounting ı double cross arm.



# this S&C Loadbuster Disconnect can be slammed closed without missing

This tough, rugged distribution disconnect won't twist, bend or loosen no matter how hard or from what angle it is slammed shut. To a lineman, who has to close pole mounted disconnects out on a cross arm, this means fast, positive closing. There is no chance of missing the contact or hanging up. Six of the features that help make this possible are pictured at left.

And with LOADBUSTER®, S&C's portable loadbreak tool, and LOADBUSTER DISCONNECTS, you get reliable, low-cost load switching . . . anywhere on your distribution feeders. LOADBUSTER breaks the circuit with no arc, and with no contact burning.

For more information on LOADBUSTER DISCONNECTS please write for Bulletin 721. S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 18, Ont.

**S&C ELECTRIC COMPANY**

S&C

## Sylvania **controlled** fluorescents win contract to light Panama Canal's famed Gaillard Cut!

In the Panama Canal's critical Gaillard Cut, other lighting systems tested reflected on the water, blinding ship pilots who strained to see the banks.

Sylvania beat competition by lighting the *banks*, not the water! With low mounting, sharp definition—no reflections! Pilots can see perfectly. Now at last, in the Gaillard Cut, ships can pass in the night!

Sylvania used VHO Reflector power tubes, 8 feet long, delivering the greatest reflected brightness of any fluorescent made! Standing 65 feet apart in Sylvania-developed CFR (Controlled Fluorescent Reflectance) mounts, they throw an unbroken white wall of light up the embankments.

This is just one more example of how Sylvania lighting engineers work to give you superior lighting at lowest possible TCL (Total Cost of Lighting), which means cost of lamp plus power plus maintenance. As a result Sylvania gives every user an exclusive Light Insurance Policy *guaranteeing* more light at lower cost than other brands—or your money back!

Sylvania-developed VHO-CFR system used in Panama Canal, also on airfields, billboards, in industry.

• • •

The Panama Canal Co. enjoys this insurance. Do you? Call your Sylvania representative, or write us: *Sylvania Lighting Products, a Division of Sylvania Electric Products Inc., 60 Boston St., Salem, Mass. In Canada: Sylvania Electric (Canada) Ltd., P. O. Box 1190, Station "O," Montreal 9.*

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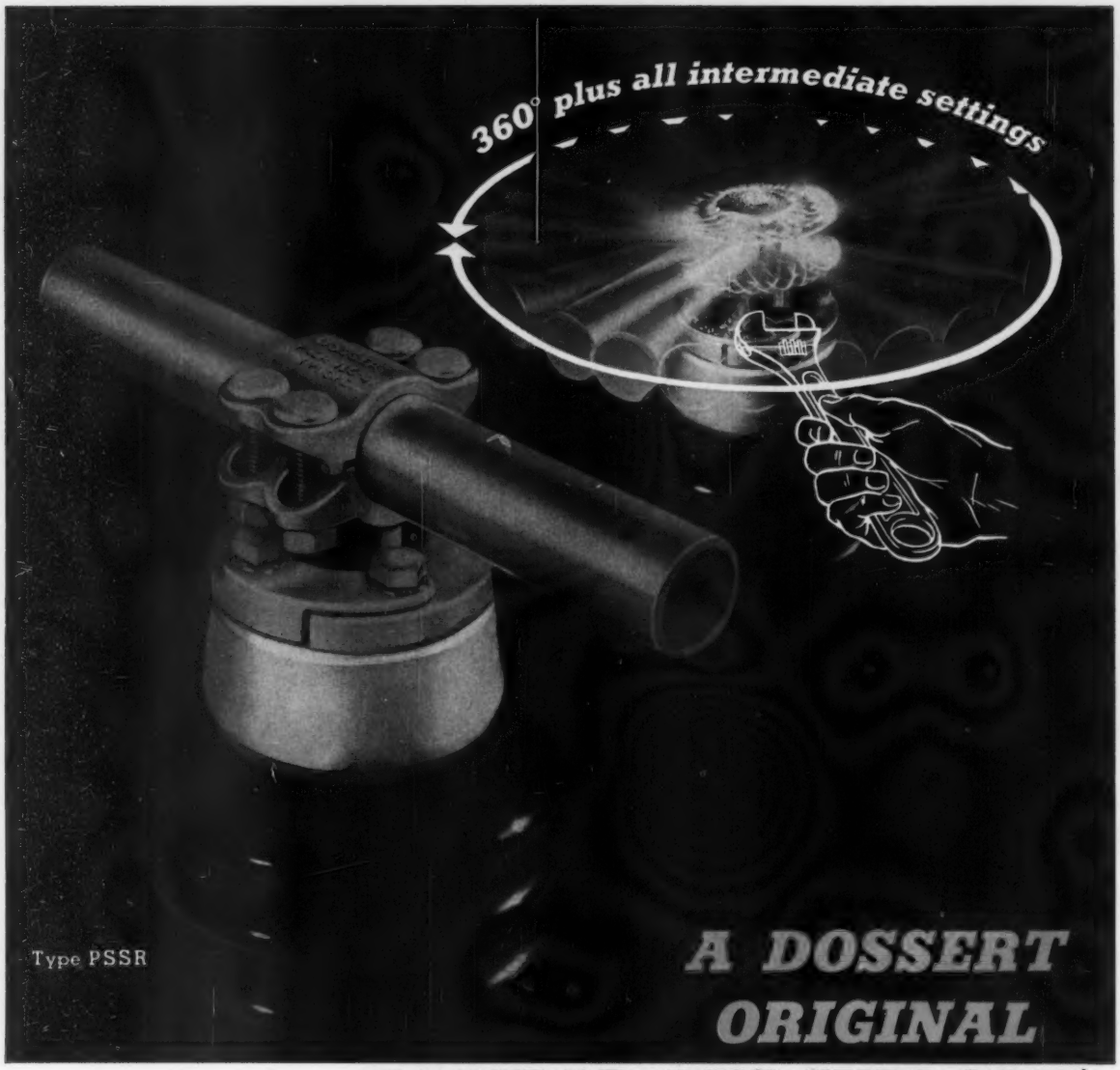


# fully adjustable, TUBULAR BUS SUPPORT*

**This bus support, made of high-strength bronze throughout, has the following outstanding features:**

- Fully adjustable to any angle whatsoever within a complete circle (360°).
- No need to lift bus out of support to change angular position.
- To change position within seconds, merely loosen 4 insulator mounting bolts, rotate assembly to desired angle and re-tighten bolts.
- No inaccessible internal bolt employed for angular setting.
- The only bus support whose angular adjustment does not jeopardize its overall strength.
- By reversing cap bus can be tight-mounted or slip-mounted.

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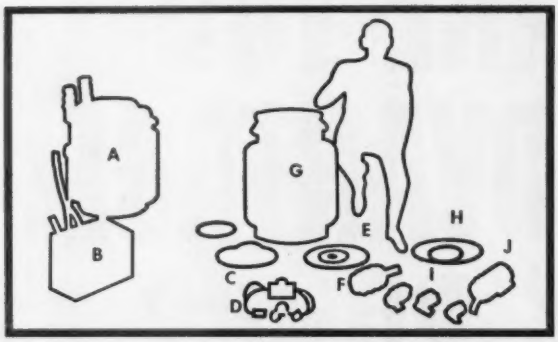
# ARE YOU TAKING ADVANTAGE OF THE BONUS FEATURES ON GENERAL ELECTRIC DISTRIBUTION TRANSFORMERS?

GENERAL ELECTRIC




**(A) NEW G-E DISTRIBUTION TRANSFORMER;** (B) Permalex* insulated coils; (C) Melalast* finish cover; (D) breaker with new settings; (E) Nitrile rubber gaskets and overload light; (F) new high-voltage bushing; (G) steel tank; (H) stainless steel clamps; (I) Strenicor terminal clamps; (J) Thyrite* Magne-valve arrester.

## On General Electric Distribution Transformers, in Addition to 20% Extra Loadability . . .

# Bonus Features Reduce Operation and Maintenance Costs

**Get higher loadability with new Permalex insulation— plus outstanding bonus features**

* Trademark of General Electric Co.

**J. O. SWEENY, Manager—Product Planning, Distribution Transformer Department, and the components of a General Electric 25-kva distribution transformer.**

General Electric distribution transformers feature Permalex insulation for 20% added loadability—*plus* important bonus features that can mean day-to-day savings in operation and maintenance. For example:

**New Melalast finish** on cover prevents costly animal-caused outages, eliminates need for guards or taping.

**New breaker settings** make extra loadability usable.

**Stainless-steel clamps,** and Nitrile rubber gaskets simplify maintenance, resist corrosion.

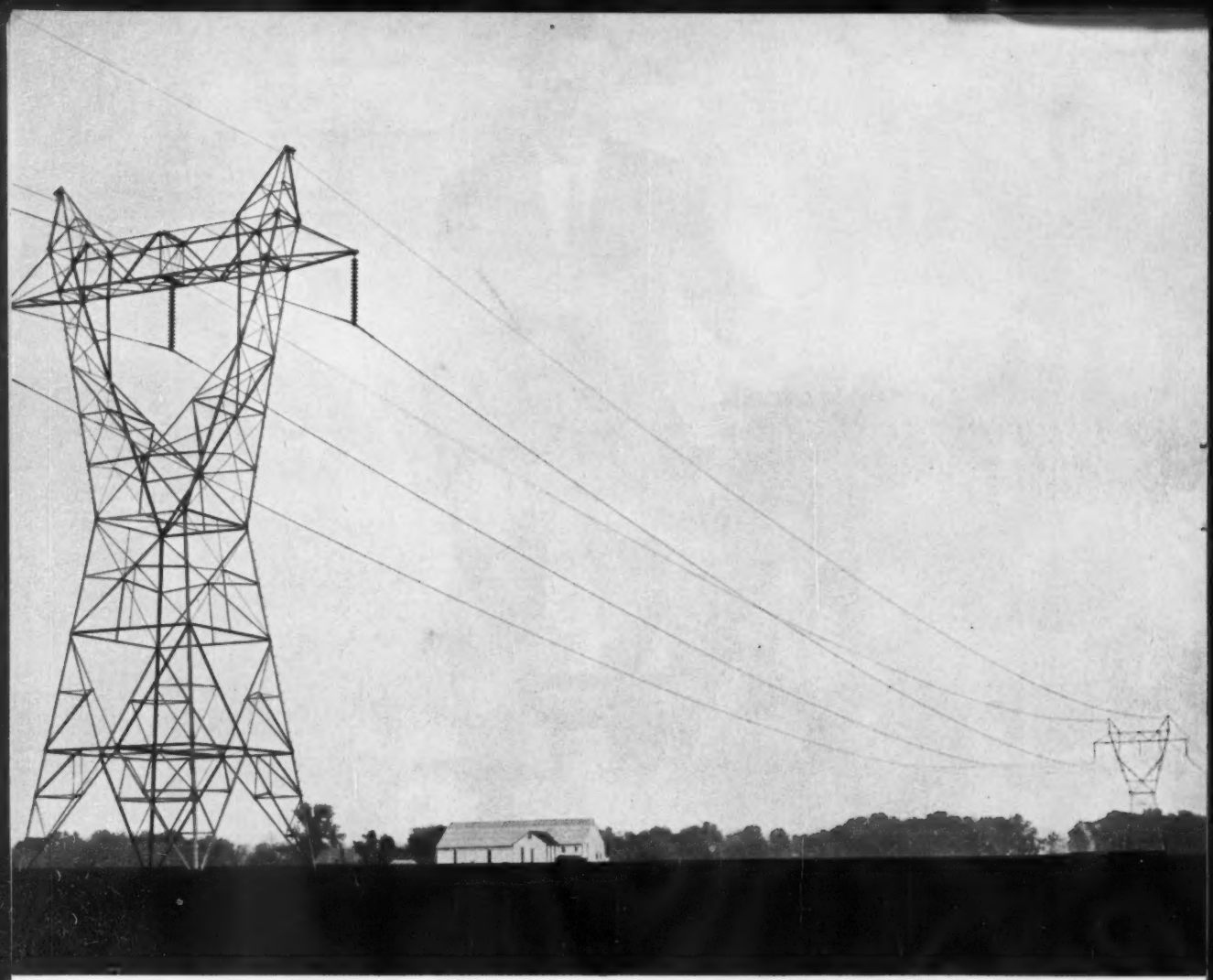
**Strenicor terminal clamps** virtually eliminate secondary failures.

**Thyrite Magne-valve lightning arrester** provides optimum protection against lightning surges.

Feature by feature, G-E distribution transformers offer you greater value for your dollar. Ask your G-E Sales Engineer for more details—and the 10 reasons why General Electric is your best transformer buy. Or write for bulletin GEA-6070, to Sect. 431-90, General Electric Co., Schenectady, N. Y.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC



# Ground wires of Bethanized Strand protect 220-kv tap line

This 26-mile tap line, originating at the South Akron (Pa.) substation of Pennsylvania Power & Light Company, will eventually connect with the Brunner Island Steam Electric Station. The 220-kv line has 137 towers, with spans ranging from 581 ft to 1540 ft. Its three power conductors are protected by two overhead ground wires of ½-in. extra-high-strength bethanized "C" coated strand. Siemens-Martin "C," in ⅜-in. diameter, is used for the counterpoise.

Utilities can obtain virtually any degree of protection against corrosion with bethanized strand. In addition to the "C" coating, bethanized strand comes in three other coating weights—A, B, and D. Each coating is 99.9 per cent pure zinc, applied to the strand wires by a special electrolytic process. The coatings are ductile, and uniform in thickness.

The "D" coating, furnished in common, Siemens-Martin, and high-strength grades, contains four times the weight of the "A" coating. Yet the "A" coating is adequate for any installation where atmospheric conditions are good. The "B" coating is twice the weight of "A"; the "C" coating is three times the weight of "A."

If you would like full information on bethanized strand, drop a line to the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

*Export Distributor:* Bethlehem Steel Export Corporation

**BETHLEHEM STEEL**

BETHLEHEM STEEL

# DEEP DEEP GROUNDING

## INSURES EXTRA PROTECTION

• Heat treated, alloy steel driving stud resists mushrooming — can be used over and over. Couplings of rugged Silicon Bronze.
• Completely machined point speeds driving. All rod sections are threaded on both ends for use as top, intermediate or bottom section.
Permanently Moist Soil

### Blackburn Sectional Rods Get Down Into The Permanently Moist Soil

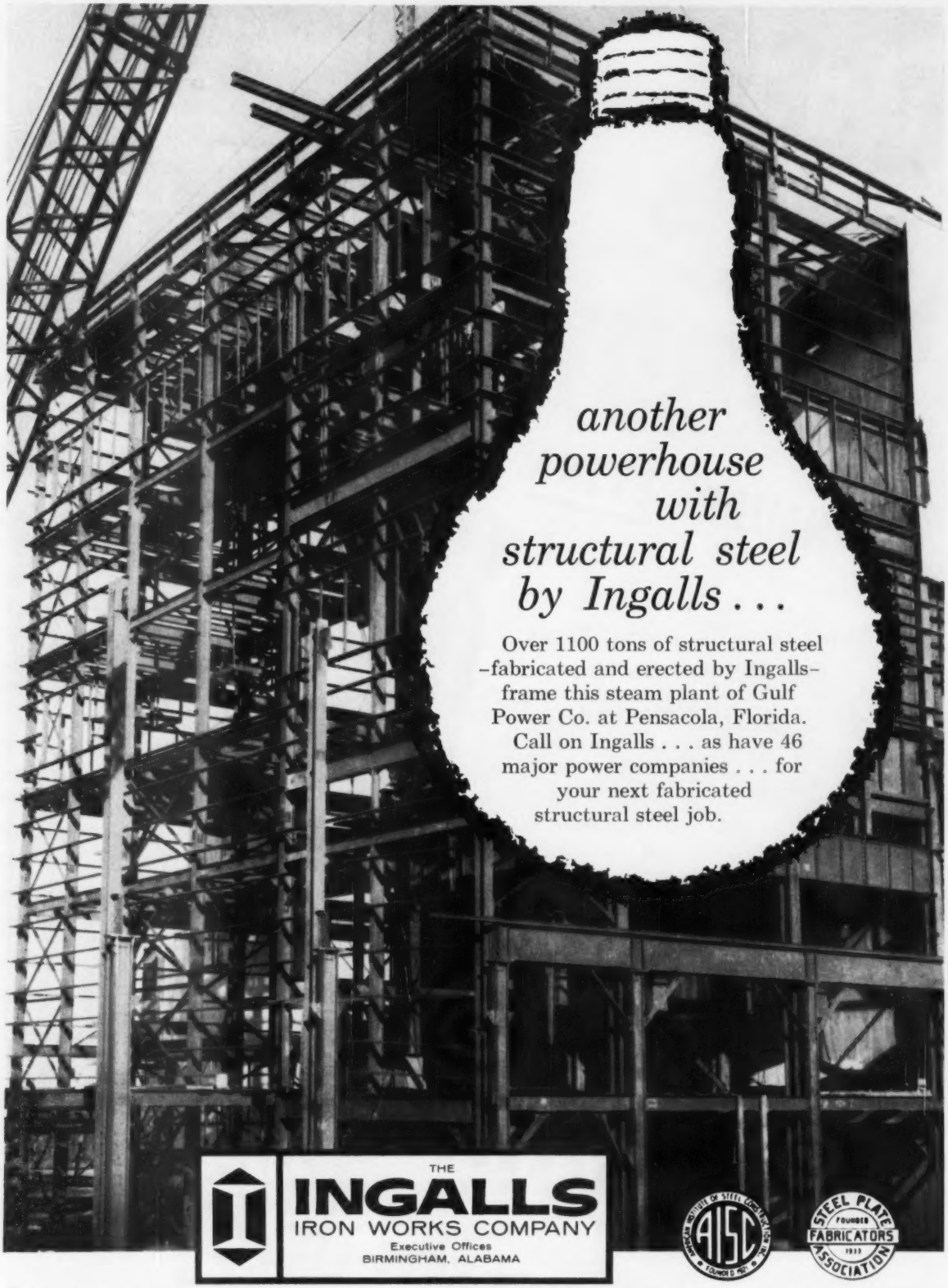
Drive down to permanently moist soil that gives lower earth to rod resistance. Actual experience shows a few dollars invested in deep grounding has saved thousands of dollars in overhead burn-outs.

- BLACKBURN Sectional Rods have a uniform coating of highly conductive corrosion-resistant copper, molecularly bonded to *rigid steel core.*
- Driving studs and couplings interchangeable with all standard sectional ground rods.
- Available through Electrical Distributors.

**JASPER BLACKBURN CORPORATION**
1525 Woodson Rd., St. Louis 14, Mo.
WYdown 3-9430

**BLACKBURN** *Sectional* COPPER BONDED **GROUND RODS**

*Distributed on the West coast by KORTICK MFG. CO.*



*another powerhouse with structural steel by Ingalls . . .*

Over 1100 tons of structural steel –fabricated and erected by Ingalls– frame this steam plant of Gulf Power Co. at Pensacola, Florida. Call on Ingalls . . . as have 46 major power companies . . . for your next fabricated structural steel job.

THE INGALLS IRON WORKS COMPANY
Executive Offices
BIRMINGHAM, ALABAMA

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STEEL PLATE FABRICATORS ASSOCIATION

**Ingalls Industries are** / **The Ingalls Iron Works Company,** Sales Offices: New York, Pittsburgh, Chicago, Houston, New Orleans, Atlanta • **The Ingalls Steel Construction Company,** Sales Offices: New York, Chicago, New Orleans, Pittsburgh, Houston, Atlanta • **Birmingham Tank Company,** Sales Offices: New York, Pittsburgh, Chicago, Atlanta, New Orleans, Pascagoula **The Ingalls Shipbuilding Corporation,** Shipyards: Pascagoula, Mississippi, Decatur, Alabama; Sales Offices: New York, Chicago, Washington, Houston, New Orleans, Atlanta

# Will it do?

**Here is a practical test for the adequacy of Thorex intermediate class arresters**

What test is there for the adequacy of O-B intermediate class arresters for today's load and equipment protection? Here is a very practical approach to this question.

How many stations do you now operate, built in the period between 1949 and 1957, and protected with the highest grade (station class) arresters then available? Is this protection still satisfactory?

Today's Thorex Dynagap Type GP intermediate class arrester offers you at least the same, and in many cases much greater protection, than the most costly arresters installed in your stations three to ten years old. The Type GP sells for about half the equivalent rating in station class. Therefore, if you are faced with the problem of budgets vs. protection, the low-price Thorex Type GP may very well be your answer on the basis of a direct comparison with your own existing equipment.

Characteristics of the Type GP arrester are not common throughout the industry - - they are highly *uncommon*. They are typical of the big surplus value that has brought Thorex into prominence. When you must combine low cost and high protection, you can put complete dependence on the Type GP Thorex Dynagap arrester.

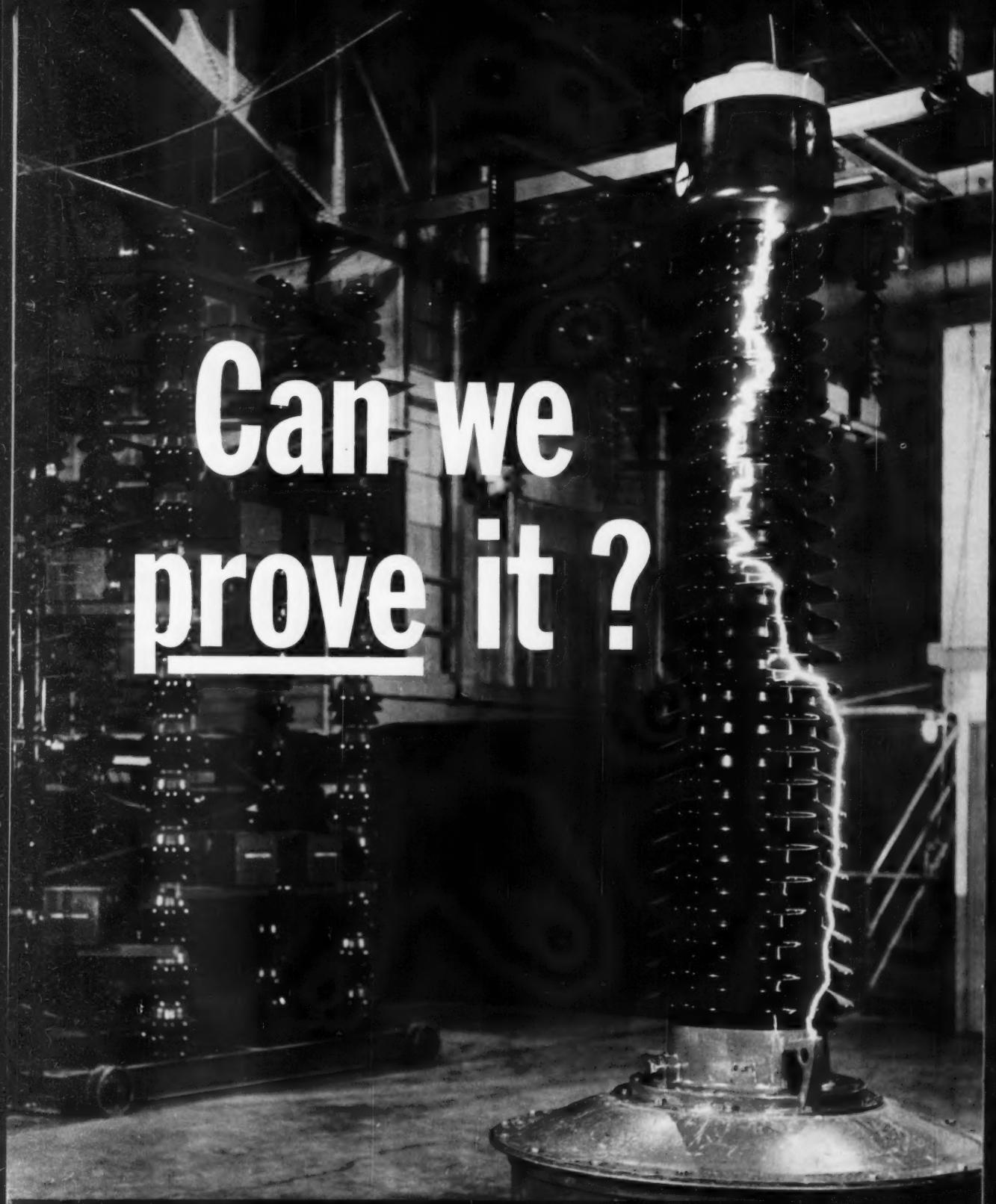
OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10004-H1



# Can we prove it ?

The O-B laboratory impulse generator is unique, not for its maximum voltage output but for its remarkable wave-front control and oscillography — unique, not for the machine, but for the ability of the men who designed and built it, and the skill of the men who run it. Here, a 345-kv O-B condenser bushing is being subjected to steep-wave impulse. Out of the picture men are obtaining clean, detailed oscillograms on the industry's most advanced technical equipment. All of this has only one purpose — development of a superior product, and solid proof of that superiority.

# O-B's capacity for research on bushings . . . large or small . . . is a priceless part of the product

We say we make an excellent bushing for service at 345 kv, or higher if you want it. But *saying it* isn't always enough. Can we *prove it?*

Proving things at these voltages takes big facilities. But they are just expensive bundles of machinery and wire unless re-enforced by fine brains.

Ingredients that can't be valued in dollars are just the things that put such a big dollar's worth in O-B apparatus bushings. From the drawing board to the shipping dock these bushings enjoy special privileges that never show *on the product* because they are always *in the product.*

If you want bushings that have a way of staying off your mind - - bushings from 15 kv as far up as you want to go - - merely mention O-B when you place your apparatus order.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

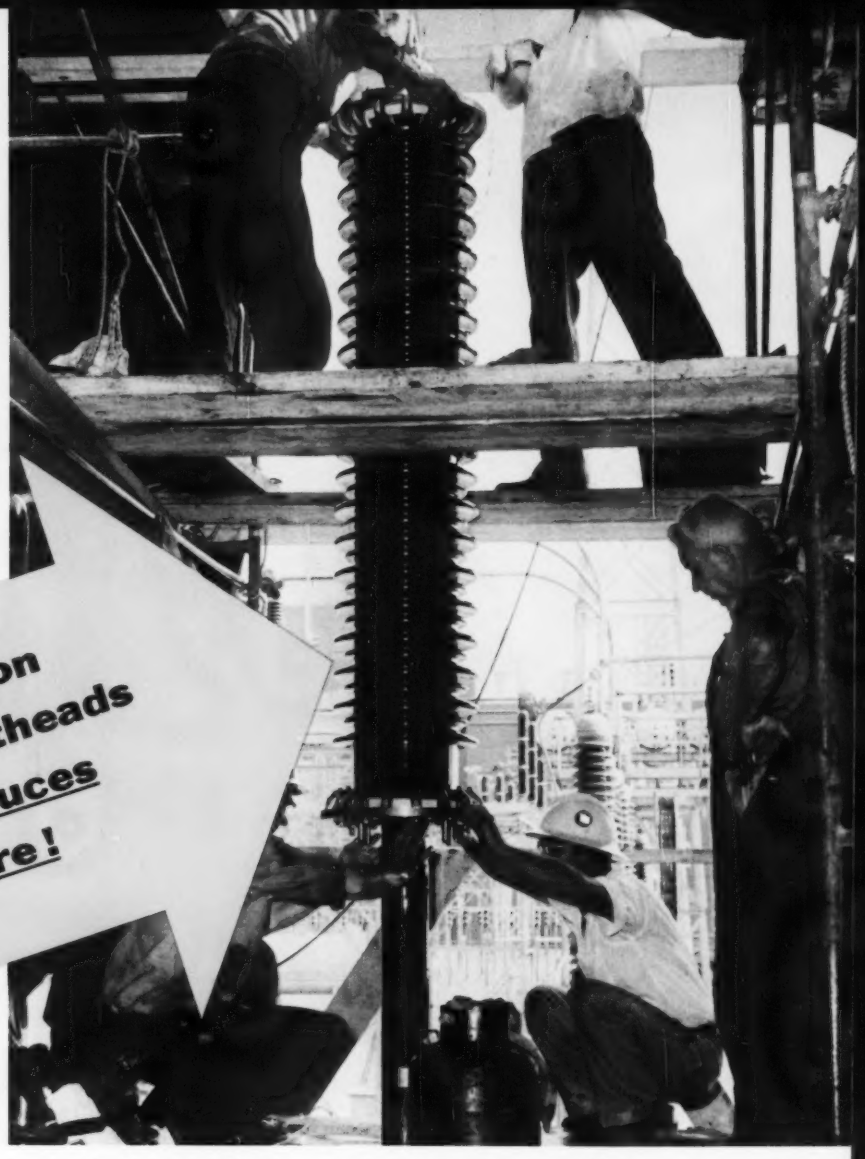
HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10004-H23

# What's a few hours?

**Quick installation of new O-B potheads materially reduces cable exposure!**



Lowering the factory-assembled housing and capacitor stack over a 230-kv cable buildup. Reduced handling time means that an O-B capacitor-graded pothead can be built, easily, in a working day. Cable exposure is cut to a matter of five or six hours — the all-important factor in time-saving.

Pound-for-pound, potheads as installed are the most expensive type of high voltage insulation. Can anyone find a few hours' time-saving in over-all cost? Probably not.

But ask the man in the field about those few saved hours. They mean that an O-B pothead can be completed, easily, in an ordinary working day. Instead of the cable being under temporary seal perhaps over night, exposure has been reduced to only five or six hours. It's hard to put a true value on the importance of *this* time.

By using ingenious conveniences and factory-built sub-assemblies, the new O-B capacitor-graded pothead saves hours of cable exposure. It is not only efficient to install but by far the finest when it's finished.

If your plans involve any kind of underground cable systems of 115 kv and above, be sure to investigate this new O-B terminal equipment.

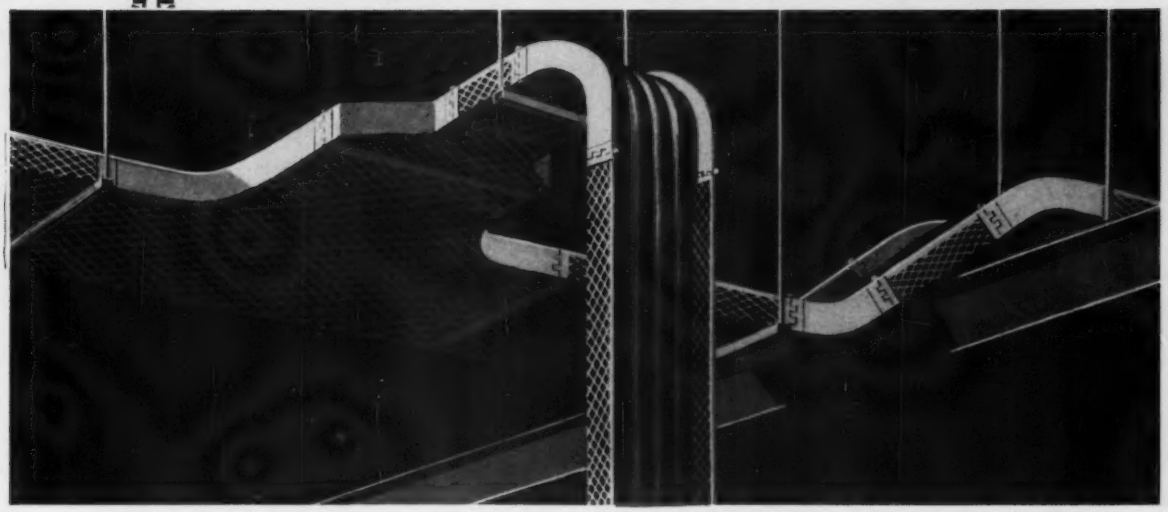
**OHIO BRASS COMPANY, MANSFIELD, OHIO**

**Ohio Brass** HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

10004-H4

# WHY NOT THIS?



## COPE WIREWAY CABLE SUPPORTING SYSTEMS SAVE "3 WAYS" OVER "TRADITIONAL" MATERIALS

Why pay a premium for your cable supporting equipment—when Cope Wireway offers a *completely integrated system* for much less. Compare these facts for yourself.

- ***Lower material cost—***
  One section of 24" wide Wireway supports *as many cables* as 16 lengths of 4" conduit—at only 1/10th the weight. That means you're buying much less materials regardless of the size of the job.
- ***Less to install—***
  Wireway's lightweight and unique coupling method, speeds joining of straight lengths and fittings—even in close quarters. A Cope system comes *complete* with all necessary accessories—ready to go.
- ***Built-in expansibility—***
  With Wireway, you need not be concerned about costly re-routing or later additions to your system. Cables are always readily accessible and Cope's pin type couplers can be quickly disconnected to permit change in direction or elevation.

Ask for proof! *See your authorized Cope Electrical Wholesaler* for more information on economical Cope Wireway—in either aluminum or hot dipped galvanized steel. Or write us direct.

1102

**COPE**

**Originators of the first integrated line of Cable Supporting Systems**

**• WIREWAY • CHANNEL • LADDER • CONTROLWAY**

***Sold only through authorized electrical wholesalers***

**DIVISION OF ROME CABLE CORPORATION • COLLEGEVILLE, PENNSYLVANIA**

# HOW SOUTHERN STATES' BV-33-F CUTOUT CLEARS RESTRICTED OR HIGH FAULTS WITH EQUAL DEPENDABILITY

The complexities of today's distribution systems present a real challenge to the designers of cutouts. Industry requirements call for interrupting capacities up to three times higher than a few years ago. And yet the cutout must clear restricted faults with equal ease and sureness.

Large bore tubes, vented freely at both ends, will clear extremely high faults easily. Small bore tubes, vented at one end, will clear low faults easily. The big problem is to do both.

The Southern States BV-33-F Heavy Duty Cutout clears the complete range of fault currents with equal dependability—without damage to the cutout.

### What About Single-Venting?

In single vented cutouts, the rocket effect of the tube, as gases are ejected, must be considered. Some type of shock absorber to cushion the fuse holder, as it tends to thrust upward, must be provided. But so far no practical recoil mechanism has been devised that can fully absorb the violent recoil action. Thus a substantial amount of shock is transmitted to the mounting, insulator, bracket, and cross arm.

As interrupting capacities on single-vented cutouts are increased, bore diameters become critical. If it is large enough to handle high faults, it may provide only borderline protection on restricted faults. Resorting to some extraneous means, such as special types of fuse links, is a dangerous concession to security—as there is no assurance of proper fusing in the field.

### What About Controlled Venting?

Providing a small vent hole in the top hardware to permit a limited amount of gas to escape is not the solution either. This practice was dropped by Southern States long ago, when it was found that the hole became enlarged after each operation, endangering proper clearance of low faults.

### Here's the Answer

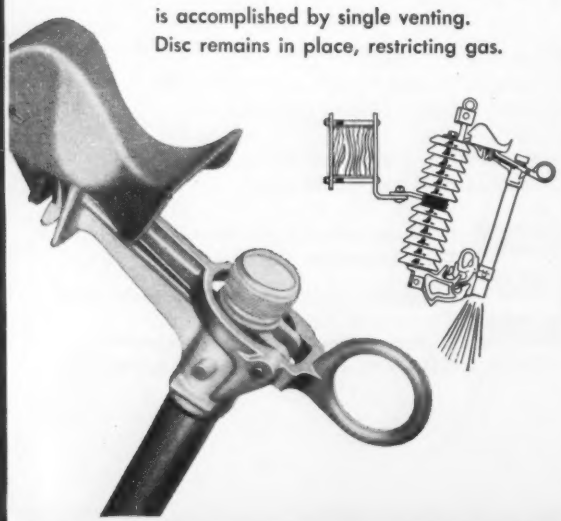
The BV-33-F offers all of the advantages and none of the disadvantages of single-venting or controlled-venting. This is accomplished with an economical expendable cap which confines gases on restricted faults, but allows them to double vent on high faults. Forces inside the tube are equal and opposite. Stress on the mounting is virtually eliminated. The cutout can operate time and time again without loss of efficiency. There is no built-in battering ram—no intricate mechanism, or springs to worry about. And any standard EEI-NEMA fuse link will provide positive operation every time.

Utilities throughout the nation are finding the BV-33-F a practical, workable solution to cutout problems.

Get complete information from your Southern States representative, or write for Bulletin 580C.

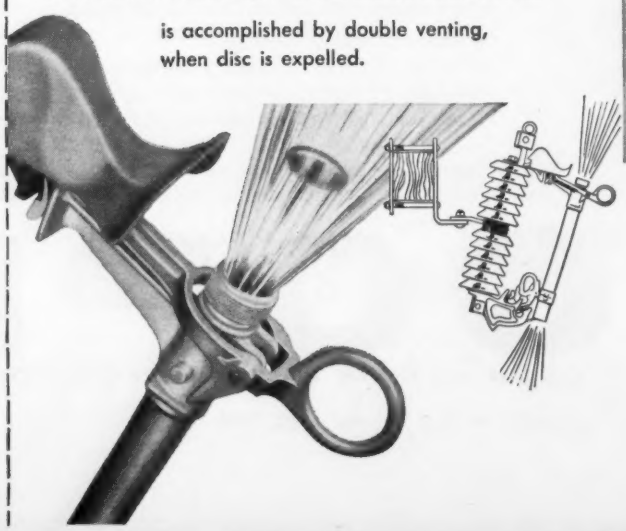
## LOW FAULT CLEARANCE

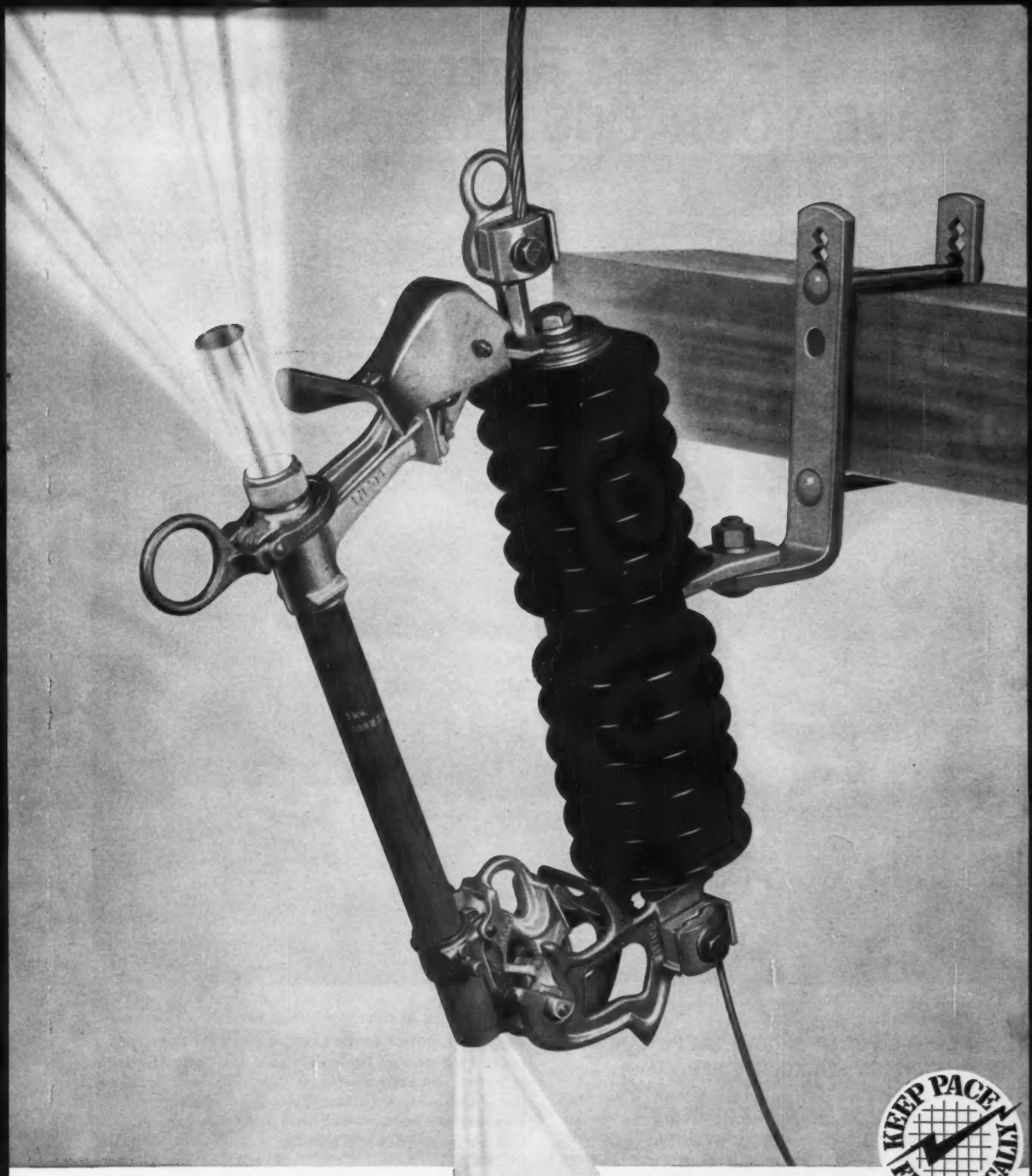
is accomplished by single venting.
Disc remains in place, restricting gas.



## HIGH FAULT CLEARANCE

is accomplished by double venting,
when disc is expelled.



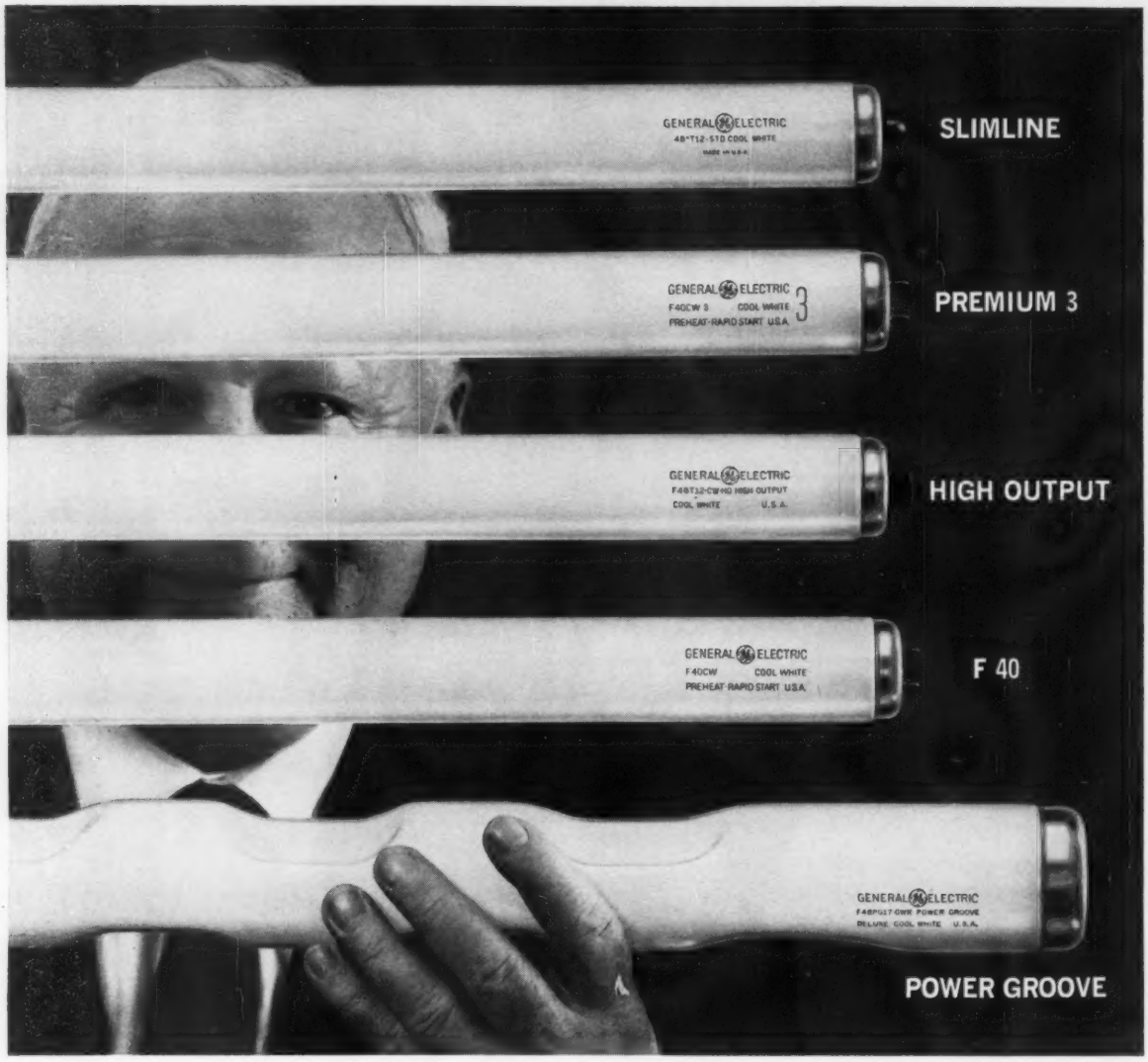



**SOUTHERN STATES EQUIPMENT CORP.**

HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

# General Electric Fluorescent Lamps
# SAVE YOUR CUSTOMERS MONEY




*Take initial cost for example:*

**NEW G-E POWER GROOVE LAMPS CAN SAVE CUSTOMERS $15 TO $85 PER LAMP!**

General Electric's Power Groove* Lamp is the most powerful, most popular high intensity fluorescent you can buy. Because it *delivers* more light, users can have brighter plants, offices, stores, even outdoor lighting *while using fewer lamps and fixtures.*

Thus they can save, on initial cost, $15 to $85 per lamp over previous fluorescent types, depending on the installation. It's all because of the grooves in the tube which bend the arc stream and lengthen it to create extra light.

G-E Power Groove Lamps are a product of the same General Electric Lamp research that has improved *every* G-E Fluorescent Lamp—whether it's the slimline, high output, or one of General Electric's two new 40-watt lamps.

**WHICH G-E MONEY SAVER LAMP IS THE BEST BUY?** There's one that will solve any lighting problem. And General Electric's published record of performance leadership is your assurance that, if they use G-E Lamps exclusively, your customers' lighting systems stay up-to-date automatically. For more information call your G-E Lamp supplier or write: General Electric Co., Large Lamp Dept. C-010, Nela Park, Cleveland 12, Ohio.

*General Electric trademark for its non-circular cross section fluorescent lamp

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

*General Electric . . . where bright ideas become better lamps*

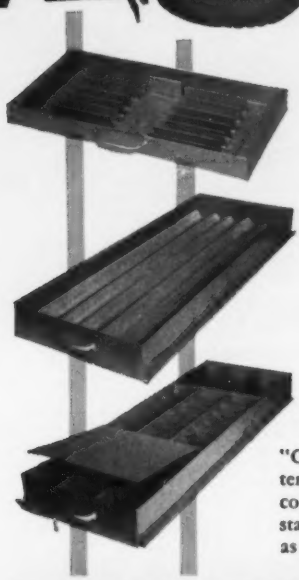
# public utility men prefer—

## YORK-HOOVER
### YMR-76 Service Bodies

MODERN

PROVEN

EFFICIENT



"Custom" features such as material drawers with adjustable compartments are available as standard or optional equipment, as required.

**LESS SERVICE HOURS...**

plus extra savings in operators time are the results obtained by hundreds of YMR-76 Service Bodies in operation today. That's because YMR-76 units are compact and rugged . . . provide ample and convenient carrying space for materials and tools . . . with capacity for adjustment to meet changing conditions. Write for complete details, price, and delivery information today!

**CLIP AND MAIL TODAY!**

Dept. 1E, York-Hoover Corporation
York, Penna.

Please send me a copy of Bulletin No. 942 covering your YMR-76 Service Body.

Name_____

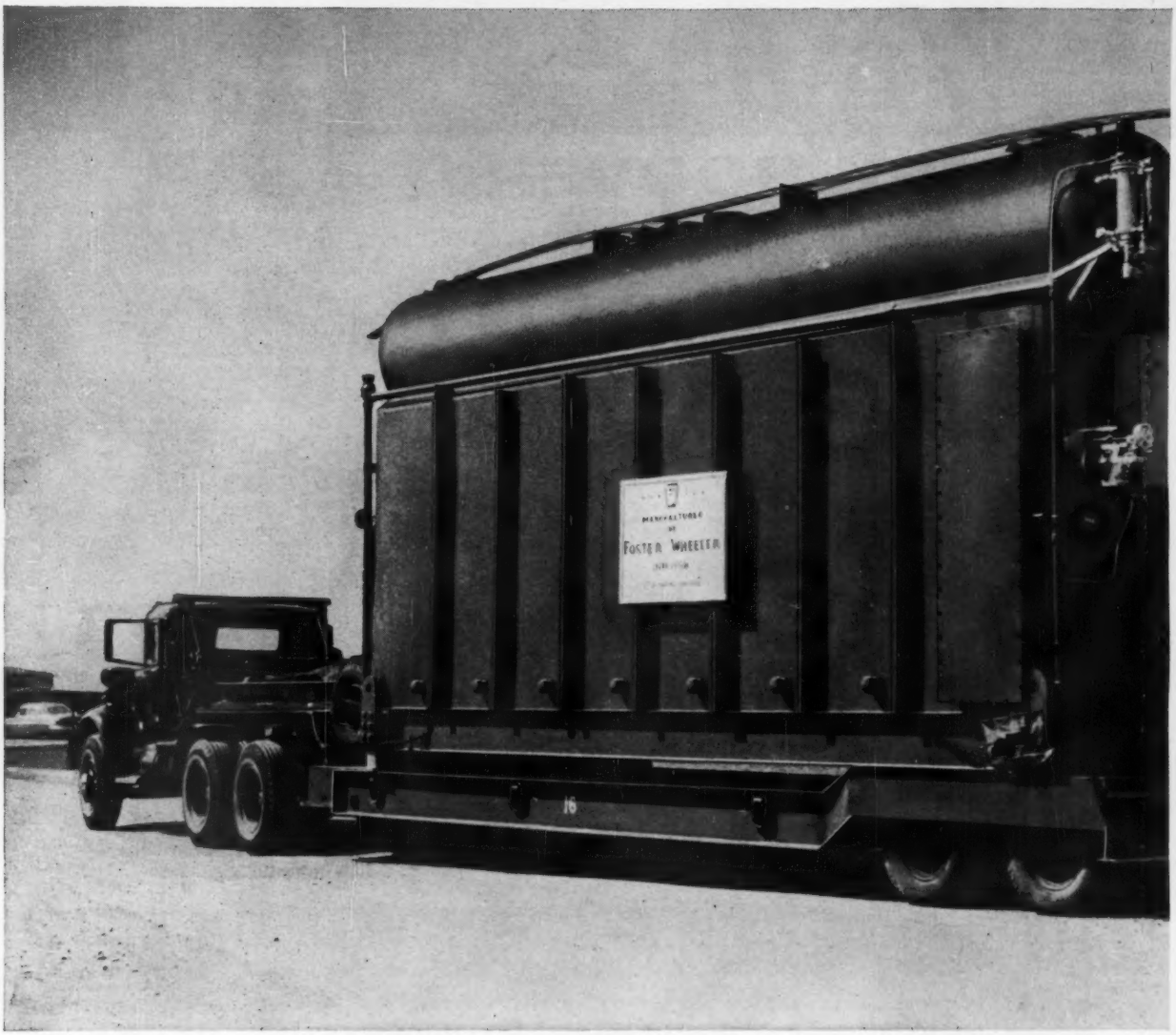
Company_____

Address_____

City and State_____

BODY DIVISION
**YORK-HOOVER CORPORATION**
YORK, PENNSYLVANIA

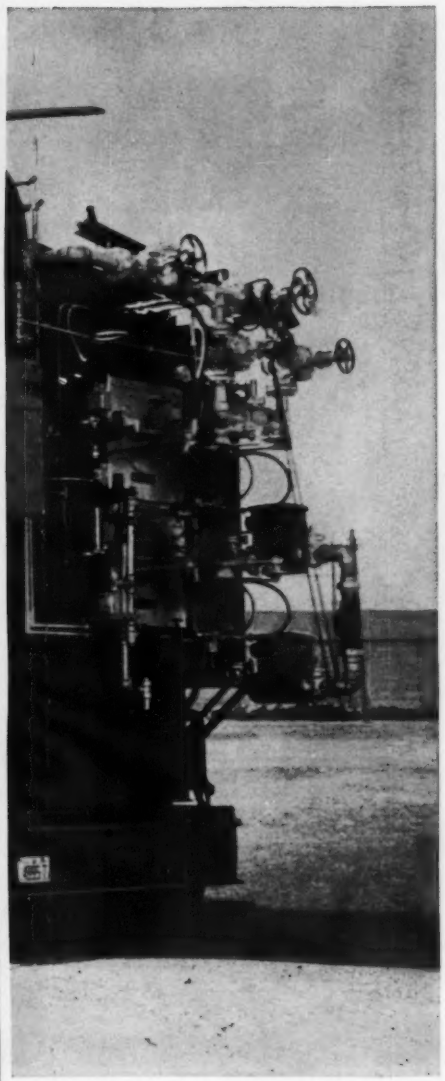
CREATIVE ENGINEERING FOR THE PUBLIC UTILITY INDUSTRY SINCE 1892




Foster Wheeler Packaged Steam Generator on its way to a refinery, where it is now producing 50,000 lb/hr of high-purity steam for processing and heating purposes.

—PETROLEUM PROCESSING

—CHEMICAL PROCESSING



# Foster Wheeler delivers the steam you need and the economy and efficiency you want, in one package

If you need 13,000 lb/hr or more of steam at pressures of 250 psi or above, one of the best ways to begin planning your steam generator installation is by contacting Foster Wheeler right now.

This is Foster Wheeler's record of experience in meeting steam requirements with packaged steam generators.

The first water tube shop-assembled packaged unit was built by Foster Wheeler in 1940, to solve an important defense problem. Today, standard Foster Wheeler Packaged Steam Generators, firing fuel oil and gas separately or in combination, are serving refineries, process and manufacturing plants, hotels, dairies . . . virtually every type of business and industry throughout the world.

Most recent Foster Wheeler development in packaged steam generators is a stoker fired model, the first available to industrial users of steam.

In short, the *heat engineering* experience that goes into Foster Wheeler Packaged Steam Generators is unique in the power industry. And the result is a product engineered for dependable, economical and efficient production of high-purity steam . . . and delivered as a package which keeps installation costs to a minimum.

Make planning your steam generator installation easier by getting full information on Foster Wheeler Packaged Steam Generators *before* you start writing your specifications. Write Foster Wheeler Corporation, 666 Fifth Ave., New York 17, for Bulletin PG-58-2. Or better still, contact Foster Wheeler directly and discuss your steam requirements personally with one of Foster Wheeler's *heat engineering* specialists.

*Heat Engineered* products, plants and processes . . . for the world's power, petroleum and process industries.

—SPECIALIZED INSTALLATIONS

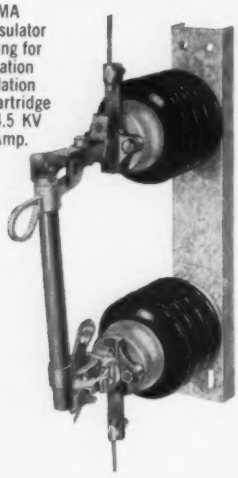
FOSTER WHEELER

NEW YORK LONDON PARIS ST. CATHARINES, ONT.

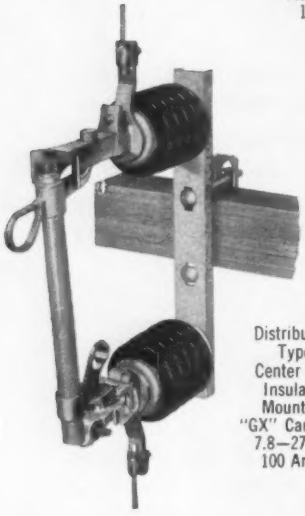
KEARNEY

# KEARNEY "G" and "GX"

TYPE GX
Tripout
Fuse Cutout
7.8—27 KV
100 Amp.



NEMA
Post Insulator
Mounting for
Substation
Installation
"GX" Cartridge
7.8—34.5 KV
100 Amp.

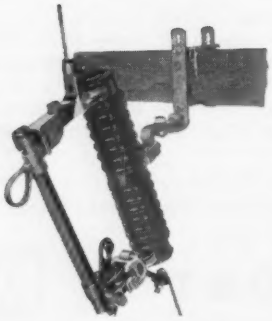


Distribution
Type
Center Bolt
Insulator
Mounting
"GX" Cartridge
7.8—27 KV
100 Amp.

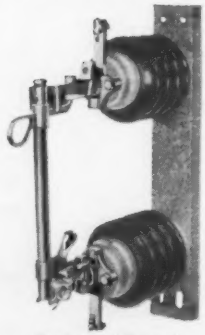
Type "GX" Cartridges vent at bottom only on low-amperage faults . . . at both ends on high fault currents. Both vents are in line with axis of tube, reducing shock recoil to a minimum. On high amperage faults, top venting action blows small disk out of expendable cap to safely relieve gas pressure.

## UPDATE YOUR OLDER CUTOUTS WITH KEARNEY CONVERSION UNITS

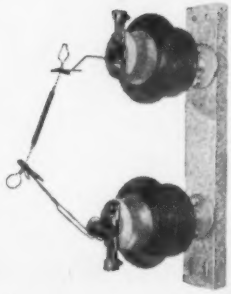
These modern current-carrying parts install on existing mountings to give you all of the outstanding features and performance of the newest Kearney Cutouts—positive dropout action, higher interrupting capacity, and extra strength fuse tubes.



Type G 5.2-15 KV
Type GX 7.8-15 KV



Type G and Type GX
7.8-34.5 KV



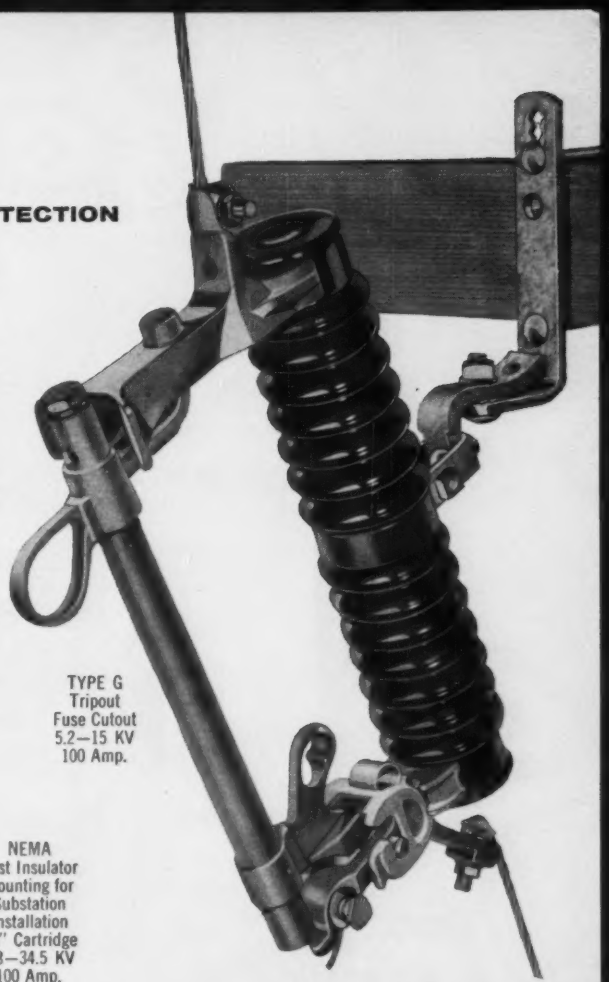
Trip-O-Link 50 Amp.
23-69 KV

**for better construction – safer maintenance – specify KEARNEY products**

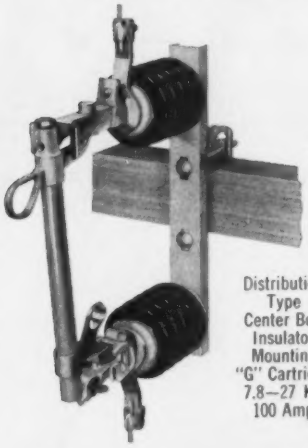
# cutouts...

## FOR DEPENDABLE, MODERN SYSTEM PROTECTION

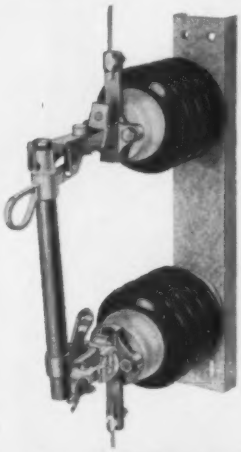
Kearney Type "G" and "GX" Tripouts assure the highest level of operating dependability and economy for full range distribution system protection. Both interrupt fault currents ranging from minimum melting of the link to maximum rating of the cutout with any size button head link up to 100 amperes. A choice of venting is offered by two cartridge types, interchangeable in the same voltage ratings. Full-time double venting is provided by the "G"... and pressure-controlled double venting by the "GX." These two cartridges, and a wide range of interrupting ratings, voltages and mountings meet every operating requirement.



TYPE G
Tripout
Fuse Cutout
5.2—15 KV
100 Amp.



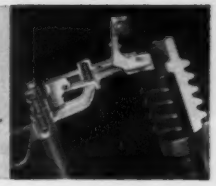
Distribution
Type
Center Bolt
Insulator
Mounting
"G" Cartridge
7.8—27 KV
100 Amp.

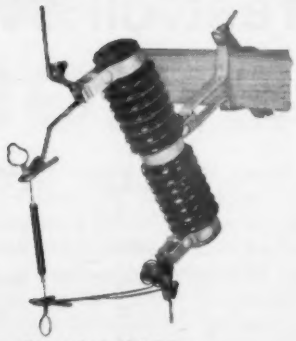


NEMA
Post Insulator
Mounting for
Substation
Installation
"G" Cartridge
7.8—34.5 KV
100 Amp.

Front vent directs expulsion gases away from line equipment. Gas pressure from top jet keeps cartridge in place and upper contacts closed until arc is extinguished. Size of top vent in double vented cartridge allows build-up of ample pressure to extinguish low amperage arcs, yet enables cartridge to withstand gas force of high current faults without rupturing.

Heart of Type "G" construction is this full-floating constantly aligned upper contact, which cannot be misaligned by high current interruption or extreme side thrust during closing. During interruption, force of cartridge thrust is absorbed by full-floating contact until arc is extinguished and cartridge drops out.

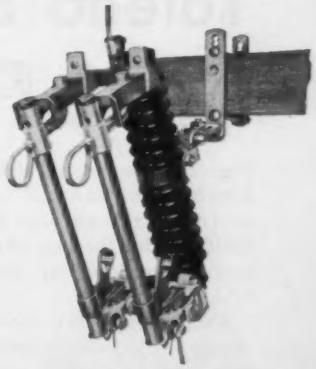




Trip-O-Link 50-100 Amp.
5.2-15 KV

## KEARNEY DUAL CARTRIDGE LOAD INTERRUPTER

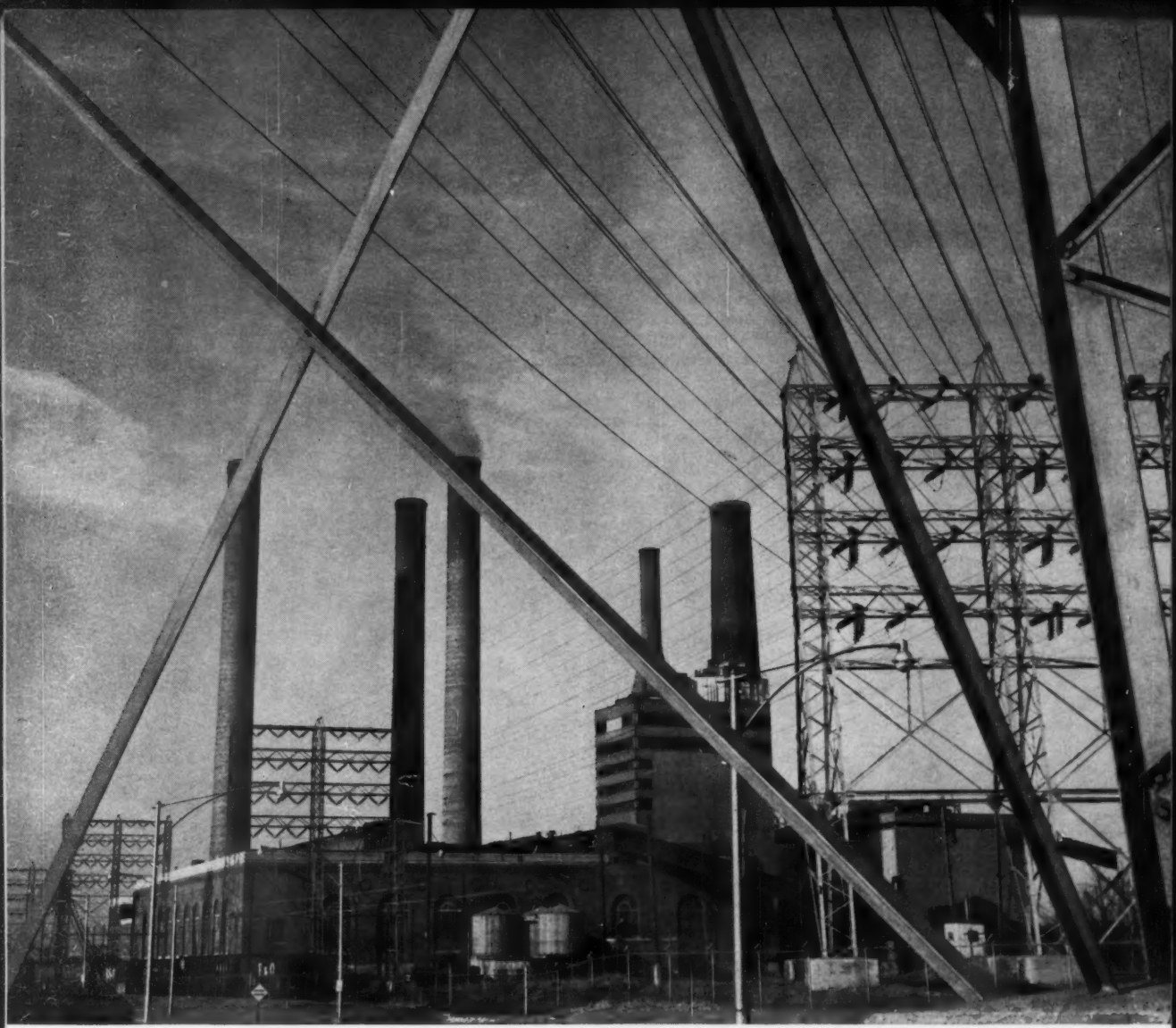
Safe, positive way to interrupt load current. For full load sectionalizing or dropping transformer or capacitor banks. Current is interrupted electrically, not mechanically. During operation, one cartridge, fused for load protection, is closed in; the other, the interrupter, fused with a low amperage link, remains open. Later this cartridge is closed in, and service cartridge pulled out. After predetermined time delay, small link blows, interrupting current safely within interrupter cartridge.




**JAMES R. KEARNEY CORPORATION**

*General Office:* 4224-42 Clayton Avenue • St. Louis 10, Missouri

*Plants at:* ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH AND CLARINDA, IOWA • GUELPH, ONTARIO, CANADA



Toledo Edison Company's Acme Plant at Toledo, Ohio, where 7 turbine generators can produce a total of 382,000 kw to serve the Toledo area.

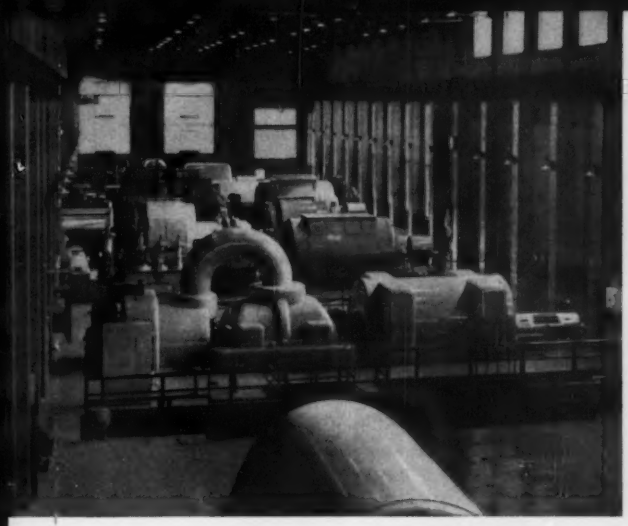
# Toledo Edison finds Gulfcrest oil still

# GULF MAKES THINGS

Eighteen years ago, Toledo Edison chose Gulfcrest turbine oil as the fill for all 7 generators at their Acme Plant in Toledo. Fifteen years later, in 1956, they again chose Gulfcrest for the first of two 135,000 kw units at their new $52-million Bay Shore Station at Harbor View, Ohio.

Recently they saw laboratory proof that Gulf makes things run better—with this long-lasting, anti-rusting, non-foaming turbine oil. In a direct comparison between the 3-year-old Gulfcrest at Bay Shore Station and the 18-year-old Gulfcrest at the Acme Plant, Toledo Edison found that the Gulfcrest oil in both systems was still within the original specifications for new oil. Here's what laboratory analyses showed:

| | Oil After 3 Yrs. Service | Oil After 18 Yrs. Service |
|---|---|---|
| Color, ASTM Union | 2.0 | 1.75 |
| Flash point, °F. | 425 | 425 |
| Appearance | Bright | Bright |
| Water, % by volume | 0 | 0 |
| Viscosity, SSU at 100°F. | 152.4 | 151.5 |
| Neutralization | .03 | .05 |
| Interfacial tension, dynes per cm at 77°F. | 35 | 29 |
| Steam emulsion number | 160 | 153 |
| Rust prevention test, ASTM D 665, Procedure A | Passes | Passes |



Gulfcrest oil has lubricated the turbine generators at the Acme Plant for over 18 years with only slight changes in original specifications. All 7 turbine generators at this plant are lubricated with Gulfcrest.

Twin Westinghouse turbine generators at Toledo Edison's Bay Shore Station. Both are 135,000 kw units. Each has a fill of 5050 gallons of Gulfcrest. New unit went on the line early in 1959.

Toledo Edison runs lab tests on their used Gulfcrest oil every 30 days. Yearly, samples are sent to Gulf Refining Technology Laboratories in Philadelphia for more complete analysis.

James Grant, left, Chief Chemist at Toledo Edison, with Gulf Sales Engineer E. A. Jeffery, who has been providing lubrication counsel to Toledo Edison since 1941.

# "like new" after 18 years' service . . .

# RUN BETTER!

With such a performance record, Gulfcrest was the natural choice of Toledo Edison last year, when they installed their second big Bay Shore Station turbine generator—a twin to the 135,000 kw unit installed in 1956.

Every performance record of Gulfcrest proves that Gulf makes things run better. In many large turbine generators Gulfcrest has served continuously for more than 20 years with neutralization numbers still low, systems still free from sludge and rust. Small wonder that in Gulf's marketing area, more power is generated by central station steam turbines lubricated with Gulfcrest than with any other oil.

More information? Just call your nearest Gulf office, or write for illustrated booklet.

**GULF OIL CORPORATION**
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

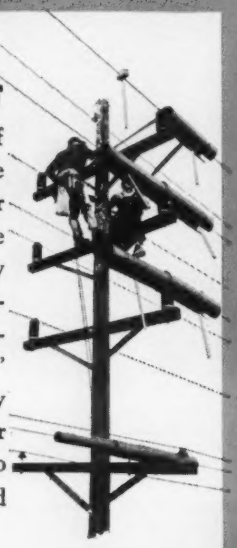
GULF

# 4 ways

## to build economy ... and better performance ... in sub-transmission construction

### TIE-HEAD LINE POST

Up-to-date version of Lapp's original Line Post—the insulator with a 29-year service record of high-security operation. Inexpensive tie-wire installation provides a "mechanical fuse" when conductor breaks. New wide-throat conductor grooves on all units rated to 88 kv. The industry standard for most applications.



### CLAMP-TOP LINE POST

Clamp attachment particularly adapted to large aluminum conductors with armor rods. Best for use in hilly terrain. Simplest installation, easiest for hot-line maintenance, and eliminates tie-wire loosening.

### HORIZONTALLY-MOUNTED LINE POST



Save up to one-third in materials—more in labor of erection—with armless construction using Lapp Line Post with integral base-and-gain. Permits longer spans, larger conductors, greater safety margins. Eliminates contamination flashover, pole-top burning.

### LINE POST FOR SLACK-SPAN DEAD-ENDS

Strain clamps supported by horizontally-mounted clamp-top Line Posts provide convenient, good-looking, radio-free slack-span support at sub-stations and line taps.

*You'll find helpful data on use of a great variety of Lapp Line Post and Station Post Insulators in the new Lapp Catalog No. 8. Write for your copy.*

*Lapp Insulator Co., Inc.*
*LeRoy, New York.*

**Lapp**

# CLEAR HORIZONS

for modern construction are now possible with RT&E's Terra-Tran for underground distribution. Terra-Tran provides improved appearance for residential areas, more reliability for industrial plants, greater safety for institutions, and freedom from primary wires and poles for shopping centers. Terra-Tran is truly the long-sought key to economical underground distribution.

RT&E CORPORATION
WAUKESHA, WISCONSIN
PORTLAND, OREGON

HH

# NEW! ...the combination of

## the combination of these two equipment in designing or procuring components for

Write today for this brochure:
**The New Story of**
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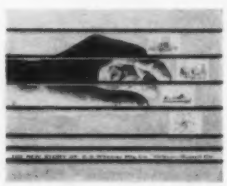

**among the many components offered are:** Condensers, Ejectors, Heat Exchangers — Bare Tube, Extended Surface Heat Exchangers,

# C. H. Wheeler Mfg. Co. / Griscom-Russell Co.

## lines offers important savings for management and engineering staffs engaged a variety of applications in power plants, marine, process and nuclear systems.

C. H. Wheeler Manufacturing Company, with 71 years' experience manufacturing condensers, ejectors, pumps and other components for the power, marine, process and nuclear industries, and Griscom-Russell, with 92 years' experience in the heat exchange field, are uniting to create an important pool of experience, products and services unmatched in industry today. The advantages offered by this combination are improved and increased selection, distribution and service, resulting in substantial savings for the current and potential customers of both companies.

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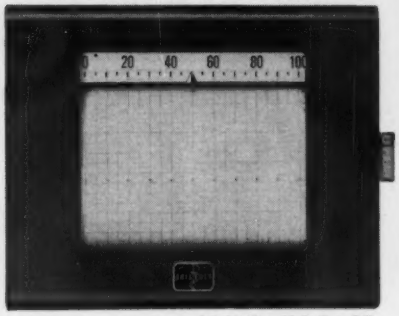
World's first mobile, self-contained nuclear power plant and first U. S. gas-cooled reactor for generating power—these are the dual aims of the Gas-Cooled Reactor Experiment Program (GCRE-I), being carried out at the National Reactor Testing Station, Idaho, for the U. S. Army and U. S. Atomic Energy Commission by Aerojet-General Nucleonics.

We're proud that Aerojet-General, prime contractors for the Army Gas-Cooled Reactor Systems Program and builders of both the reactor and its control system, selected Bristol Dynamaster* potentiometer and bridge instruments to record vital reactor data.

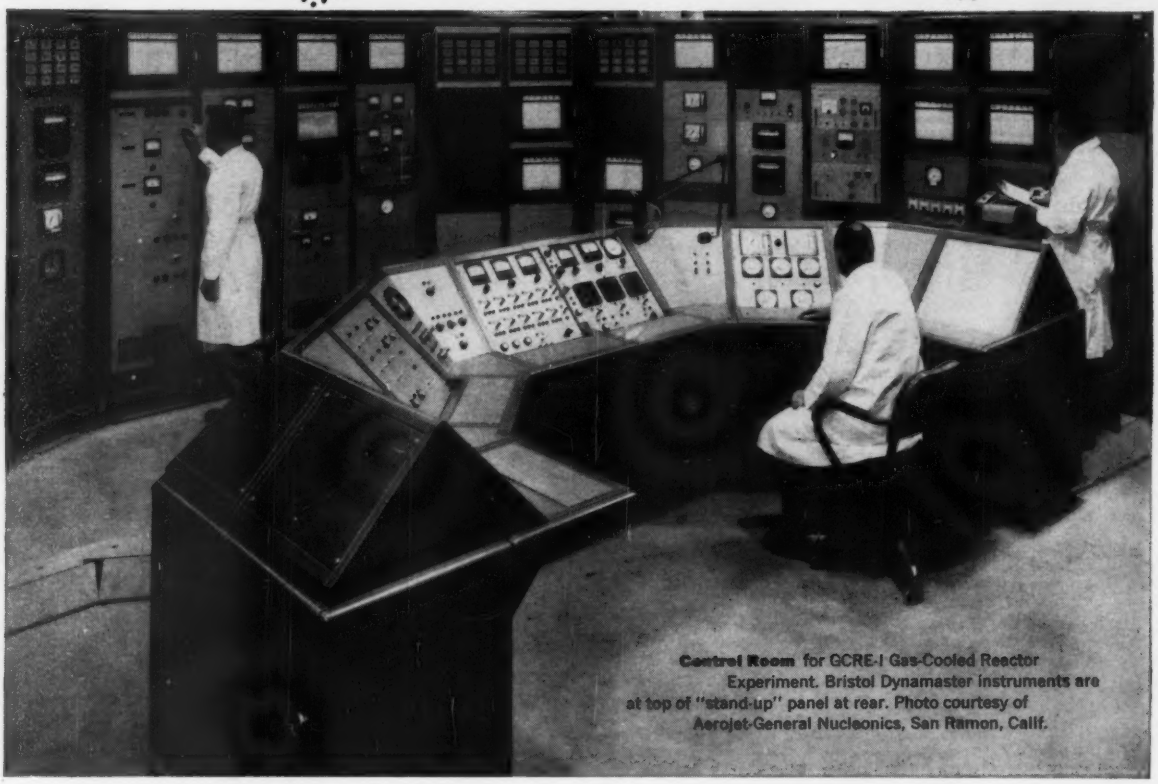
Bristol offers control-systems builders—whether for the nuclear or any other industry—the widest instrument choice on the market for measurement, recording, automatic control, and telemetering. Electronic and pneumatic types. Full-size and miniature (3" strip chart) types. For complete data, write: The Bristol Company, 116 Bristol Road, Waterbury 20, Conn. 9.25

**Bristol Dynamaster*** Electronic Potentiometer or Bridge Instrument, strip-chart model.



*T. M. Reg. U. S. Pat. Off.

# BRISTOL INSTRUMENTS *record Army reactor's progress*

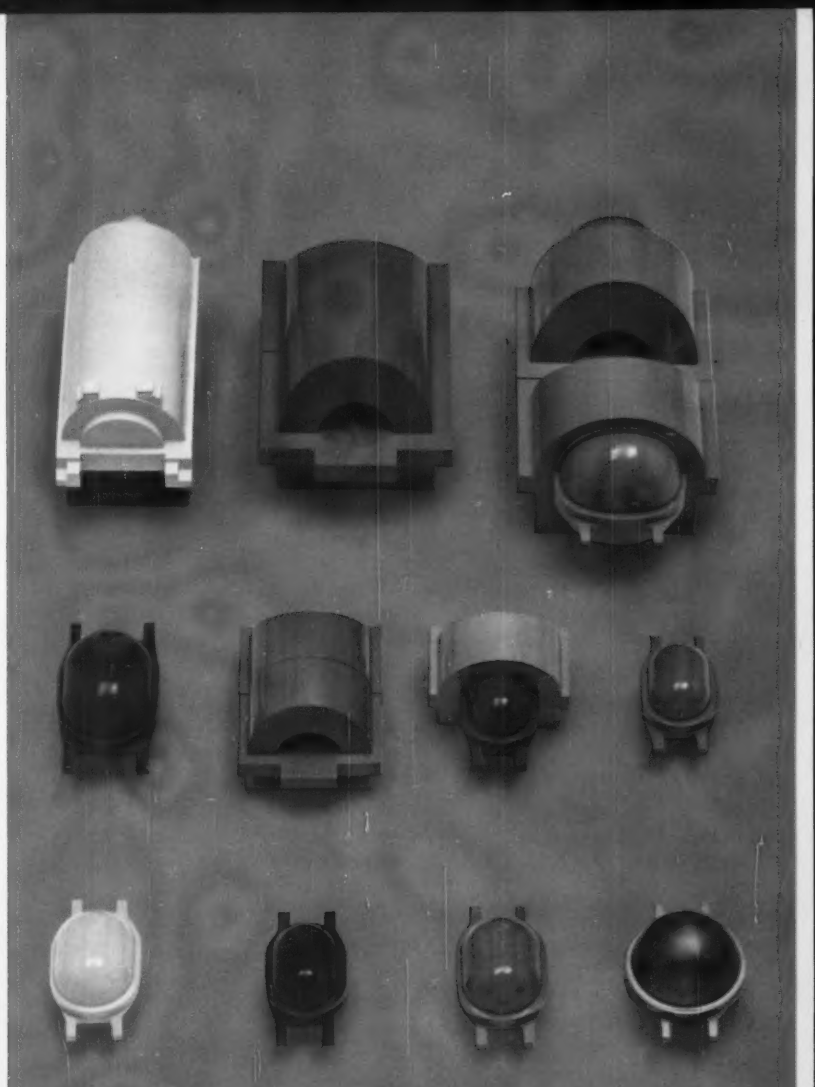


**Control Room** for GCRE-I Gas-Cooled Reactor Experiment. Bristol Dynamaster instruments are at top of "stand-up" panel at rear. Photo courtesy of Aerojet-General Nucleonics, San Ramon, Calif.

**BRISTOL**... for improved production through measurement and control

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

# Westinghouse integrated turbine components promise economical superload growth



America's electric utilities face a challenge unparalleled in history —load growth which will require a total generating capacity of more than 600 million kw in just 20 years! In the face of such tremendous demand increases, building more and larger turbine-generators at reasonable cost presents physical and economic problems never before encountered.

Through the principle of Integrated Components, Westinghouse has conquered the four primary barriers to designing and building these complex, high-capacity machines—namely, design flexibility for a wide range of machines, high reliability characteristics, fast delivery, and controlled costs.

On the following pages, Westinghouse reports on progress and development which, even now, promise a working solution to meeting future power needs economically and reliably.

YOU CAN BE SURE...IF IT'S **Westinghouse**

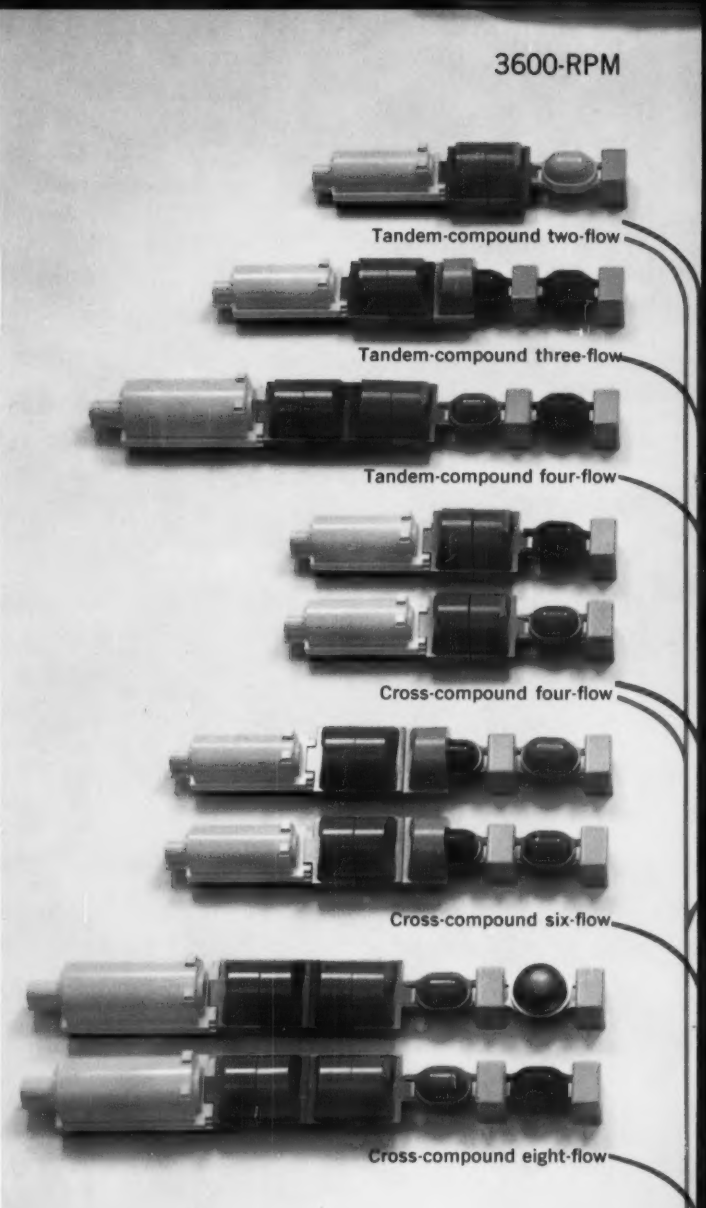
# Westinghouse integrated components combine to meet your needs faster, more economically

**1800-RPM ELEMENTS**

1. Generator
2. Low pressure
3. Large low pressure
4. Intermediate pressure

**3600-RPM ELEMENTS**

5. Low pressure
6. Intermediate-low pressure
7. Intermediate pressure
8. High-intermediate pressure
9. High pressure
10. Very high pressure
11. Super-pressure




These pre-engineered turbine building blocks are the logical solution to achieving massive power additions without prohibitive time, man power and cost problems.

After careful study of the types of machines needed in the future, Westinghouse designers found that any type could be built from a combination of the 10 basic elements shown at the left.

The elements can be arranged in single, double and triple shaft units.

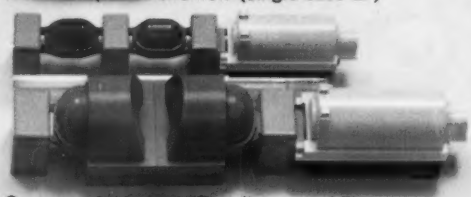
The 3600-rpm elements can be combined for tandem- or cross-compound, two-, three- and four-, six- and eight-flow machines.

A complete line of 1800-rpm units also can be built using the basic elements.

Increased ratings can be produced by adding higher pressure and temperature elements to a combination of the 10 basic elements that make up the three machine arrangements. Eventually, cross-compound machines may operate under steam conditions as high as 6000 psi at 1200° F, with ratings up to 1500 mw!

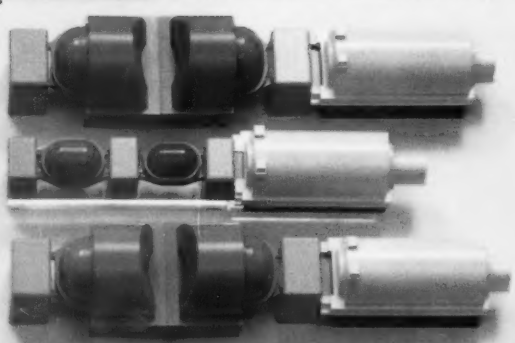
3600/1800-RPM

Cross-compound two-flow (single case LP)

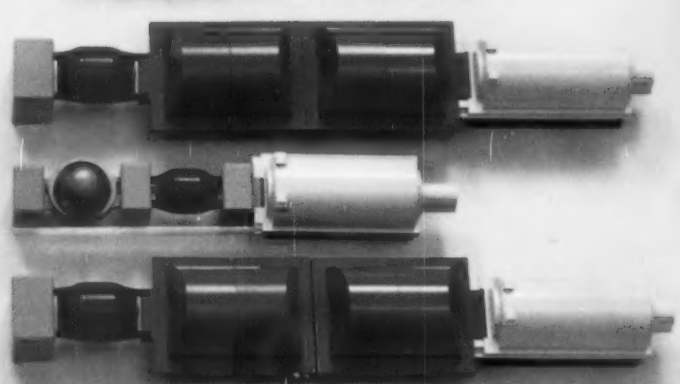


Cross-compound two-flow (two case LP)

Triple shaft cross-compound four-flow (single case LP)



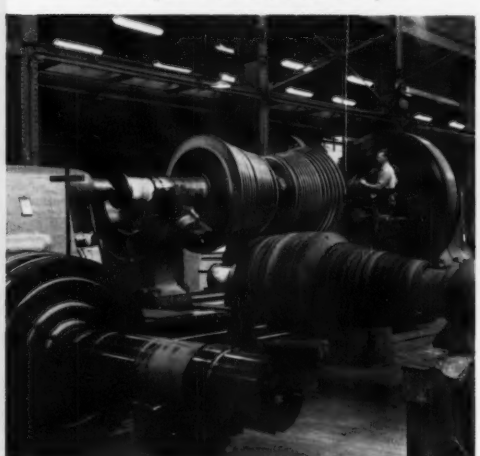
Triple shaft cross-compound four-flow (two case LP)



Triple shaft cross-compound eight-flow

# Westinghouse integrated components in use today prove their value

The Integrated Components in use today are not merely adaptations of existing elements. They are new designs based on the latest concepts. All of these design and engineering advances mean time, man power and money saved. Highly qualified personnel are freed for further research and development to help you meet expanding future power needs economically.



Spindles, shown here in three stages of development and finishing, can be ordered for back-up and machined to fit your exact requirements.

YOU CAN BE SURE...

As a result of Integrated Component Design practice, Westinghouse can order, for example, 10 duplicate sets of major castings at one time—including inner and outer cylinders, nozzle chambers, and glands—as well as a composite spindle forging for back-up. This means faster deliveries and a high degree of material and manufacturing reliability.

## INTEGRATION GOES BEYOND BASIC ELEMENTS

Associated components, such as throttle valves, steam chests, interceptor valves, oil reservoirs, pedestals and control systems, can be pre-engineered as precisely and successfully as the basic turbine elements.

For example, a thorough study of throttle valve and steam chest sizes for reheat turbines ranging up to 325 mw showed that only four sizes are needed.

Pictured on this page are only a few of the many associated components and turbine elements which, like the pedestal below, have been engineered and built on the Integrated Design principle and are already proving that this practice is a sound one.

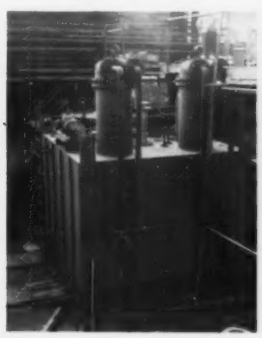
## ADDITIONAL BENEFITS

Another important area of this program is the advance planning of equipment drawings needed for customer plant layout work. These drawings include oil piping, turbine outlines and unit wiring diagrams. Preplanning puts this material in the purchaser's hands earlier and allows for faster over-all plant layout than ever before possible.

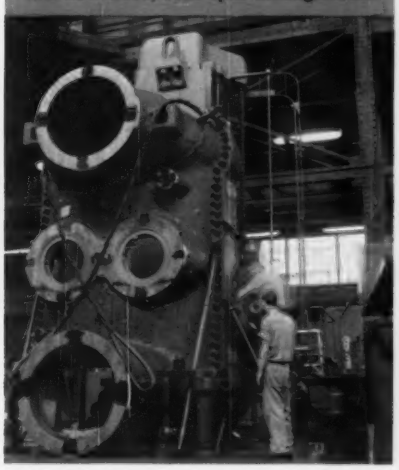
Integrated Component practice permits improved manufacturing techniques, design flexibility, faster deliveries and controlled costs to help you meet your future power needs economically.

This model of a turbine-generator shows advanced-design components in a practical application. With a capacity of 325 mw, this 3600-rpm, tandem-compound four-flow unit uses an opposed-flow high pressure element, a double-flow intermediate pressure element, and two double-flow low pressure elements. (See models on opposite page.) These same elements can be used to build a cross-compound four-flow unit.

This integrated high pressure element has been designed for a range of steam conditions from 1800 psi at 1000° F, to 2400 psi at 1050° F, for use in turbines rated from 175 mw through 325 mw. It can be used in tandem-compound three-flow, tandem- and cross-compound four-flow 3600-rpm, and cross-compound two-flow 3600/1800-rpm arrangements.



Preplanned components include the oil reservoir shown here. Three sizes were chosen for turbines ranging from 50 to 400 mw. The height and width are held constant, while capacity changes are made by varying the length, thus permitting duplications in the details—plate size, oil-pump supports, oil piping, oil-cooler supports and general hardware.

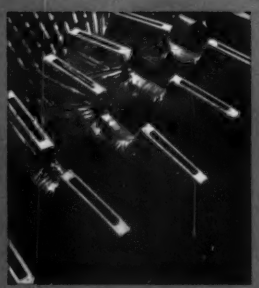


This low pressure cylinder for a 325-mw unit is typical of Integrated Component Design in practical application today.

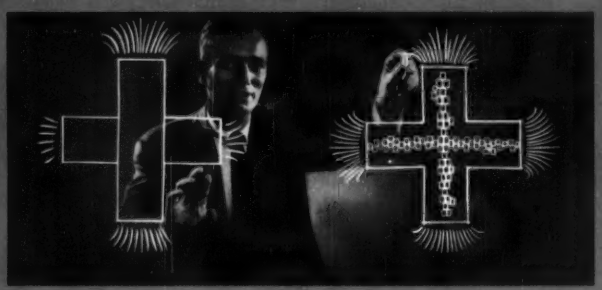
In pre-engineering low pressure turbines, designers have standardized most components. For example, low pressure cylinder covers, like the ones at the left, are exact duplicates except for the single-flow ends used in three- and six-flow machines.

E...IF IT'S Westinghouse

# generator research program leads to higher capacities, lower maintenance



Two Westinghouse developments have made it possible to build—now—generators to match the higher ratings resulting from Integrated Component Design in turbines. Thermalastic® insulation and Inner-Cooling are standard features on Westinghouse generators today, and have opened the door to greater advances for the future.



Additional advances are expected from projects now underway.

The search for an electrical sheet steel with better magnetic properties in all directions has resulted in Cubex,* which will permit higher quality sheet with lower losses.

Even Thermalastic insulation is being improved. New high-temperature resins, coupled with mica tapes using noncellulosic structural materials, have resulted in an insulation system with even greater thermal endurance.

The work on better steels, excitation systems and a host of other developments is constantly proceeding. The results will play a vital part in helping you meet future power needs economically.

*Trade-Mark

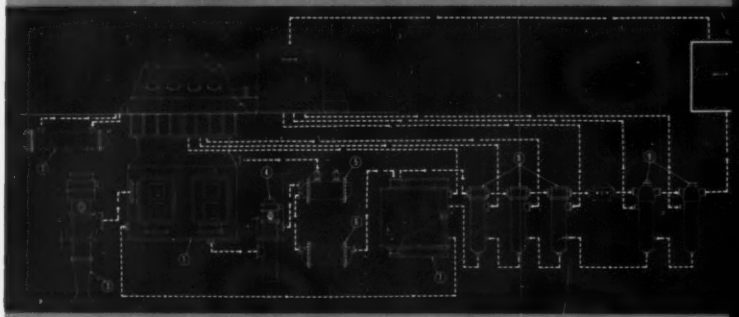
YOU CAN BE SURE...IF IT'S Westinghouse

# full line of heat transfer apparatus permits best design for higher efficiencies at lowest cost

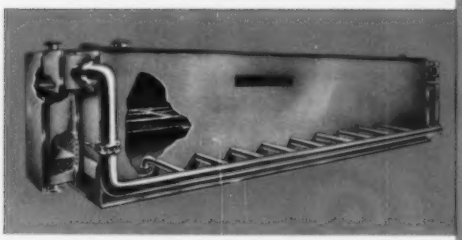
## COORDINATED DESIGN IMPROVES POWER GENERATION EFFICIENCIES

The most complete power generation product line in the industry guarantees you the added efficiency of components specifically designed to work together. The wide range of heat transfer apparatus elements shown below embodies design refinements which allow the flexibility necessary to produce these efficiencies at the lowest possible cost.

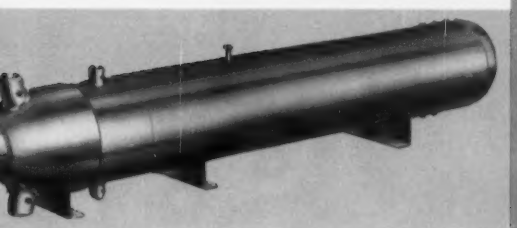
## COMPLETE LINE OF WESTINGHOUSE HEAT TRANSFER APPARATUS IMPROVES STEAM CYCLE EFFICIENCIES, PERMITS FLEXIBILITY IN PLANT LAYOUTS



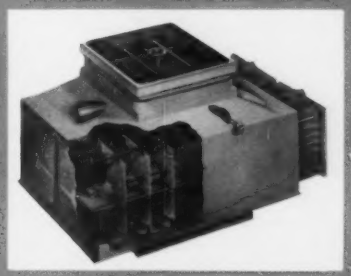
1. Condenser
2. Oil Cooler
3. Circulating Pump
4. Condensate Pump
5. Air Ejector
6. Gland Steam Condenser
7. Flash Evaporator
8. L. P. Heater
9. H. P. Heater



**Flash Evaporator:** The flash evaporator provides a low-cost means of making ultrahigh purity water for boiler feed make-up from either fresh water or sea water. The submerged tube type is also available.



**edwater Heaters:** Shown here is the new hemi-herical, welded head, high pressure feedwater heater, pecially adapted to the increased temperature and essure of the large turbine steam cycle. The new head d welding design philosophy stems from nuclear steam nerators where system integrity is critical.



**Westinghouse Radial Flow Rectangular Condensers:** Readily adaptable to any turbine exhaust configuration, exclusive Radial Flow design permits exhaust steam to completely envelope the tube bundles from any point of inlet.

**Pumps:** Horizontal centrifugal, vertical mixed flow, and propeller pumps are available in either single- or multi-stage design to cover any range of capacity and head requirements.

**Air Ejectors:** First developed by Westinghouse, a complete line of priming and operating air ejectors affords safe and reliable removal of air and noncondensables by simplified piping and the elimination of relief valves and segregating valves between stages.

**As a result of progress already made, and continuing research and development in turbines, generators, condensers and all related equipment, Westinghouse is ready now to help you plan, design and build complete generating stations to meet future power needs economically.**

**Call or write Westinghouse Electric Corporation, Steam Division, Lester Branch P.O., Philadelphia 13, Pennsylvania.**

**YOU CAN BE SURE...IF IT'S Westinghouse**

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## *PEABODY Supplies Coal To Many Of America's Leading Electric Utilities*

At breakfast this morning, when that rich golden-brown toast was served and its wonderful aroma drifted up from your plate . . . you probably didn't realize that every morning, 1,032 tons of coal is used to make the nation's toast.

Day and night . . . in our homes, offices and plants—in countless ways . . . coal serves us by generating dependable, economical electrical power. Coal's importance to the nation is best emphasized by the fact that *coal* generates more electricity than all other fuels and water power *combined.* Peabody Coal Company . . . with two billion tons of proven reserves . . . supplies many of the nation's electric utilities that bring you efficient, dependable power . . . at a price you can afford to pay.

The next time you butter your toast . . . or turn on a light—or watch television . . . think of coal and the great electric utilities that serve you.

*Now available . . . the Peabody Coal Company 1959 Annual Report. Write for your copy today! Department EW.*

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Installation of a 2500-kva Uptegraff transformer, now serving a municipal lighting plant in Massachusetts.

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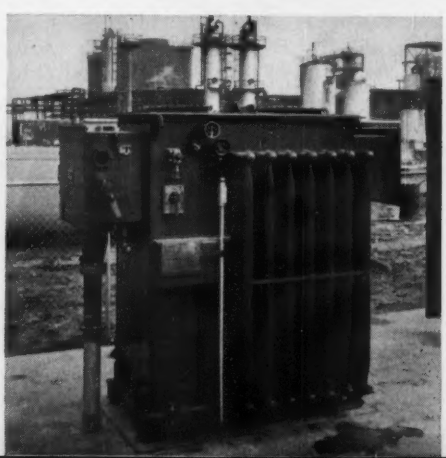
**The Uptegraff standardized "building-block" construction of Load Center Transformers (see opposite page) has many user advantages. It provides a wide variety of arrangements, so that the purchaser gets exactly what he wants. It permits faster "off the shelf" deliveries. It costs less to build, and the savings are passed on to the buyer. It reduces layout time since exact dimensions and weights are available for all modifications.**

**Uptegraff Load Center Transformers are built specifically for this service. The design is modern in every respect, with rugged construction throughout. The terminal arrangements are carefully engineered for each size and rating. Every finished product is thoroughly tested to insure maximum performance. Extensive experience has proved the dependability and economy of Uptegraff Load Center Transformers.**

This is one of several Uptegraff load center transformers furnishing power for a California refinery.



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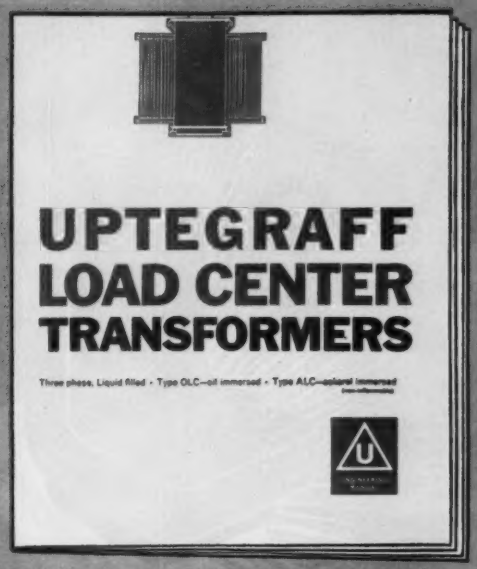
## ENGINEERING MANUAL

*It includes all the data you need for planning power-center sub-stations*

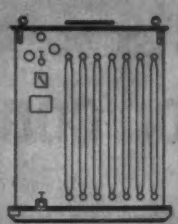



Designed with busy engineers and architects in mind, this valuable free manual permits you to develop an electrical design layout that meets your specific requirements. Included are complete drawings, ratings, dimensions, weights, performance and other data on basic units and such terminal variations as throats, junction boxes, cover bushings, etc. It contains all the information you need to work out your own combination of basic units and terminal arrangements for greatest efficiency and economy.

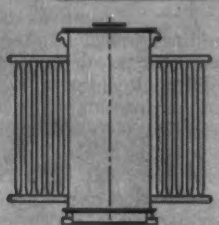
## BASIC UNITS

**Front and end views are seen below. Brochure gives complete outline drawings and specifications including performance characteristics of the basic unit.**

**Front View**

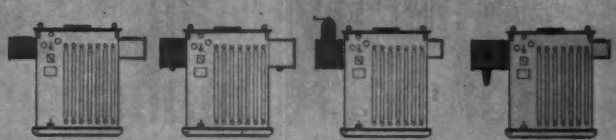


**End View**

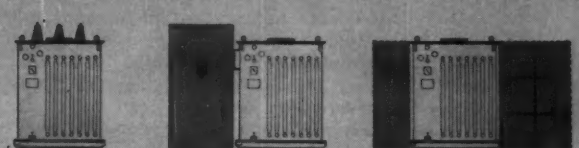


## VARIATIONS OF BASIC UNITS

**Each variation, illustrated below, is fully described with outline drawings, dimensions, weights and other pertinent application and performance data.**



THROATS | JUNCTION BOXES | OIL FUSE CUTOUTS | OIL DISCONNECT SWITCHES



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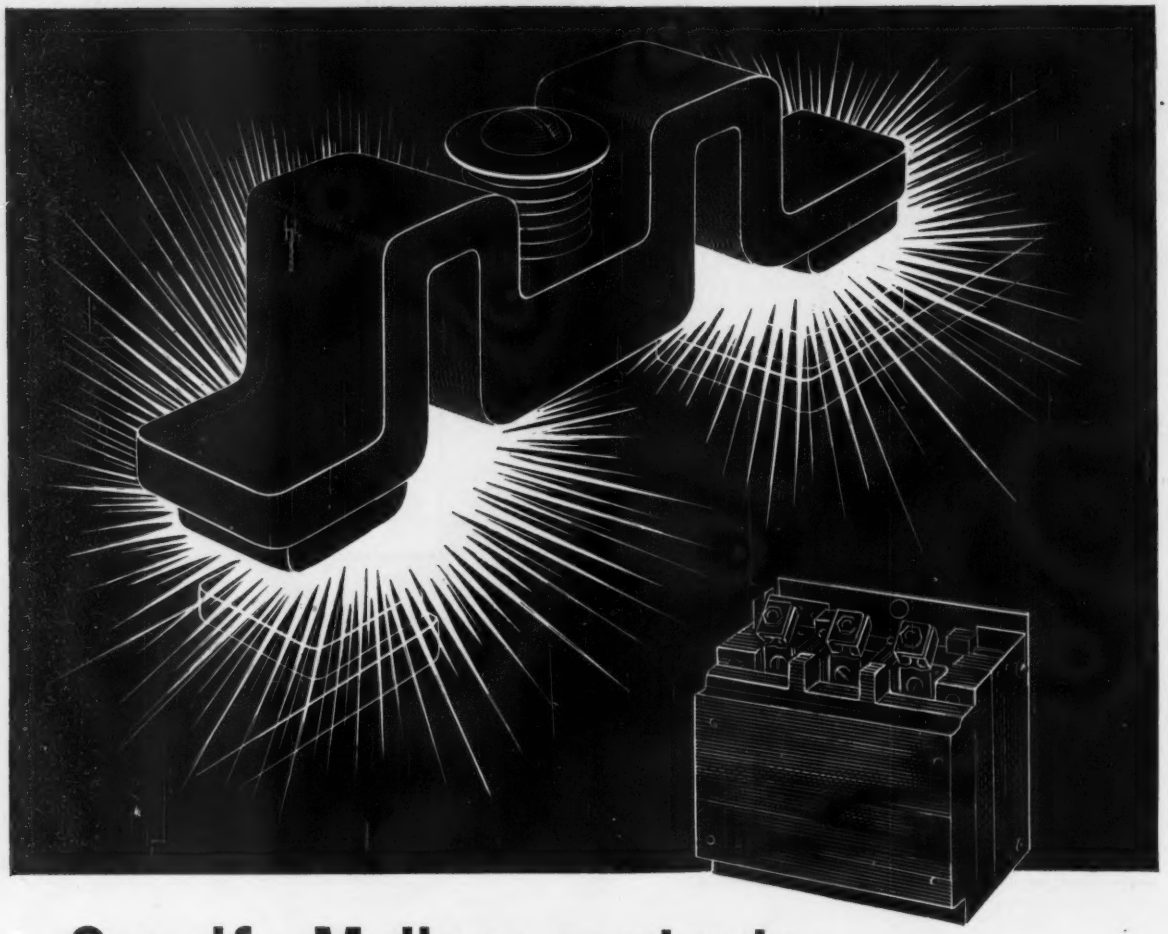

# Specify Mallory contacts for performance in motor controllers

You can't rely on contact "guesswork" in the motor controllers, power contactors and line starters you buy. The performance of this equipment always depends on the reliability of its contacts . . . their ability to stand up under heavy arcing and severe duty cycles.

For these special requirements, Mallory has developed a series of silver-cadmium oxide materials with outstanding properties. They are unequalled in their resistance to welding . . . easily take several times the current that would weld fine silver contacts. They have high resistance to arc erosion and wear. Their low contact resistance holds down temperature rise in high current circuits.

The choice of leading motor controller manufacturers, these silver-cadmium oxide contacts are part of a broad line of special materials created by Mallory pioneering in powder metallurgy. Mallory produces 147 different contact materials—in varying degrees of hardness, arc erosion resistance, mechanical strength, electrical and thermal conductivity—each with the combination of properties best for its particular applications. For top quality and positive performance always *insist* that your supplier use Mallory contacts in the apparatus you buy.

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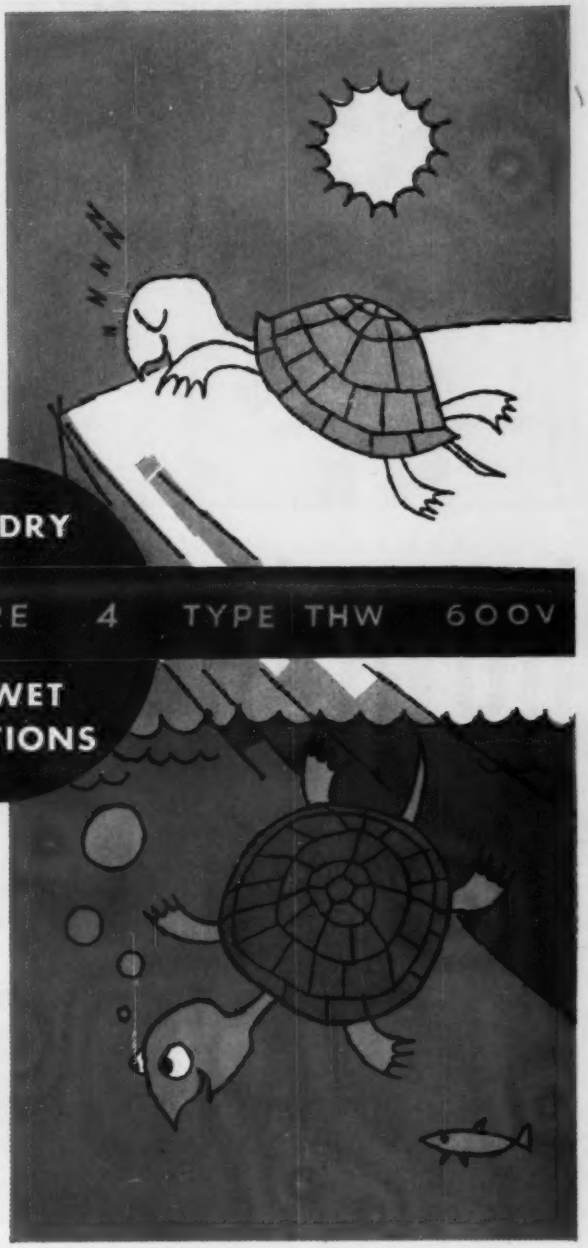

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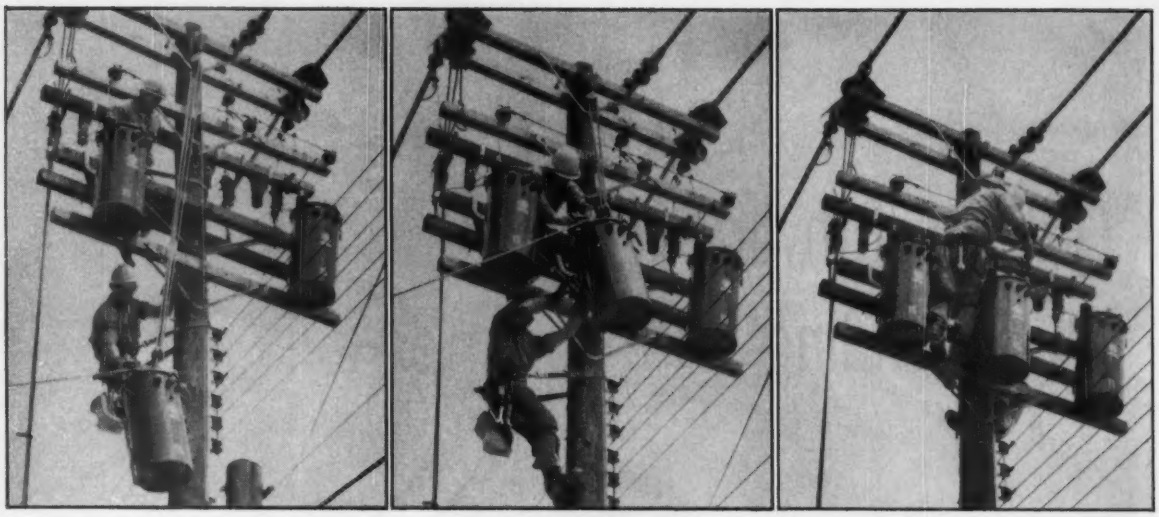
- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS



# how the POLE STAR® can be your guide to SAVINGS in the 60's

As we step into the sparkling sixties, it occurs to us that your utility can realize considerable savings during the next ten years as a result of recent improvements in the electrical characteristics of the Pole Star Distribution Transformer. These are improvements derived from the new "echelon lap" refinement of the patented lap-on-top Pole Star core.

Let us assume that your utility has a present generating capacity of a half-million kilowatts, and that this capacity will have doubled by 1970. On the commonly accepted basis of two kva of distribution transformer capacity for each kw of generation, your utility will install one million kva of distribution transformer capacity during the next decade.

Now, let us assume that *all* of this additional capacity is in transformers that have the lower copper and iron losses, the lower exciting current, and the lower impedances provided by the new "echelon lap" Pole Star core. On the basis of a conservative calculation of annual operating costs for the million kva of distribution transformers, *your utility can save a total of one million dollars during the next ten years.*

Let the Pole Star be your guide to *savings* in the sixties!

## $1 MILLION SAVINGS FOR UTILITIES

as described above are based on a conservative calculation of annual operating costs. These costs are used to evaluate the following advantages resulting from improvements in the electrical characteristics of Pole Star Transformers:

- Lower copper and iron losses mean lower system capacity requirements and less waste of energy.
- Lower exciting current means less cost for capacitors.
- Lower impedance and regulation mean more revenue because of the higher voltages applied to voltage-sensitive loads.

**PENNSYLVANIA TRANSFORMER DIVISION**

**McGRAW-EDISON COMPANY • CANONSBURG, PA. • Greater Pittsburgh District**

*Ljungstrom rotor being installed for Southern California Edison plant at Huntington Beach, Cal. Eight such Ljungstroms will serve four boilers at this station.*

# **AIR PREHEATER SERVICE** WILL STILL BE IN EFFECT ON THESE UNITS IN THE YEAR 2000

These new Ljungstrom® Air Preheaters, being installed at Southern California Edison's Huntington Beach Station, will be protected by an unusual service policy, one that guarantees regular inspection by Air Preheater engineers throughout the life of each unit.

There's no terminal date on this service — it's in effect as long as the units are in operation. In fact, Lifetime Air Preheater Service is still helping to keep the first Ljungstrom installation in the U.S. running perfectly, although it's been in operation almost 40 years.

Air Preheater provides first-rate *factory* service too, In one instance, in response to a last-minute decision to replace cold-end elements near the end of a scheduled shutdown, Air Preheater *fabricated and shipped* over 13,000 pounds of heating elements the day after the order was received.

Regular inspection and fast factory service are just two of the advantages Air Preheater offers its customers. Another is expert knowledge of boiler and preheater problems, gained through 35 years' experience. This combination—knowledge of customer problems and a *continuing* interest in them — probably explains why nine out of ten preheaters sold today are Ljungstroms.

## THE AIR PREHEATER CORPORATION

*60 East 42nd Street, New York 17, N. Y.*

# THE SANGAMO P-3 GIVES ALL THE BENEFITS OF... THREE STATOR METERING

**WITH THESE PLUS FEATURES:**

| | | P3 | Other 3-stator meters | | |
|---|---|---|---|---|---|
| | | | Type X | Type Y | Type Z |
| APPLICATION | Complete Line | Yes | No | No | No |
| | Continuous Capacity (Amps) | 200 | 150 | 175 | 150 |
| | Least Switchboard Space | Yes | No | No | No |
| DESIGN | Number of Disks | 1 | 2 | 2 | 3 |
| | Smallest Size | Yes | No | No | No |
| | Minimum Weight | 9 lbs | 17 lbs | 18 lbs | 12 lbs |
| TESTING | Number of Adjustments | 8 | 10 | 11 | 12 |
| | All Micrometer Adjustments | Yes | No | Yes | No |
| | Easiest to Test | Yes | No | No | No |
| ACCURACY | Disk Speed (Rpm.) | 8⅓ | 30 | 16⅔ | 30 |
| | Lowest Starting Watts | Yes | No | No | No |
| MAINTENANCE | Sectionalized Construction | Yes | No | No | No |
| | Cover Replacement Cost | $2.56 | $3.71 | $10.25 | $7.05 |

Sangamo has developed this three-stator polyphase meter to meet the measurement problems created by today's large loads. The P3 is the smallest, lightest three-stator meter made . . . the only one with single disk, round cover, modern design. It is a slow speed meter. And, it is the only three-stator meter with full 200 ampere capacity. Fill your three-stator metering requirements with Sangamo's complete line of P3 Meters (Class 10, 100, and 200 in socket and bottom-connected construction).

**SANGAMO ELECTRIC COMPANY**
**SPRINGFIELD, ILLINOIS**

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JH60-2

# Editorial Comment

MARCH 21, 1960

## The AIEE Winter Meeting Rang the Bell

The AIEE Winter General Meeting, we are happy to report, certainly lived up to its advance billing as a "real humdinger." Even though attendance was off from last year's record, the sessions in the power system categories were exceptional.

The program gave conspicuous emphasis to several topics that today occupy positions of unique importance in the evolving pattern of future power systems. Outstanding discussion centered on such things as: Standardization of transmission voltages above 345 kv; the interrelated problems of switching surges, lightning arresters, and reduced apparatus insulation, and the well-coordinated and imminent new standards for rating, testing, and applying circuit breakers. Talked out in forum sessions were the comparative merits of operational gaming and probability techniques for planning and evaluating the adequacy of generation reserves. Wide general acclaim and good attendance also marked discussions on the application of computer techniques to system operation and distribution planning. And so it went, topic after topic.

True, there were weaknesses. The ratio of conference to transactions papers climbed from almost 1.4 to 1 last winter, to 2 to 1 this year while the number of paper dropped about 18%. Attendance at nuclear sessions continues to be distressingly low for such an important subject. And presentations in the areas of molecular electronics, thermo-electricity and thermionic energy conversion were so esoteric as to be frustrating.

But on the whole the 1960 Winter Meeting was "one for the books." It remains to be seen whether the ensuing general meetings of 1960 can come up to the quality it attained. If they do, 1960 will be a cardinal year in the Institute's history.

## Yard Lights Can Help Cut Crime Too

With crime a hot topic across the country these days, all available means must be exhausted to minimize the menace. In this private citizens have as much responsibility as anyone and will benefit the most from crime control.

One preventive measure is increasingly emphasized to help minimize crime and at the same time cut pedestrian accidents. This is encouraging the use of yard lights as well as porch lights on residences, and stressing the need to keep them on all night.

Some utilities are encouraging this practice. Seattle City Light is among the latest to ask customers to burn their outside lights at night continuously as a protection against burglars, prowlers, auto thieves, and others. They have backed the plea up with a special post-lamp offer to residential customers.

Here then is a way for utilities to brighten up side streets with supplementary street lighting, to help fight crime, and incidently to raise load and revenue.

This kind of program is well worth promoting!

# Democrats Merge Power And Resources in Platform

## Western group builds plank on 'natural resources.' Utah P&L's Naughton compares it to Socialists' plank of twenties

Under the heading of "Natural Resources," the Natural Resources Committee of the Western Democratic Conference has formulated a federal power plank that ". . . openly advocates Socialization of America's electric industry," to use the words of E. M. Naughton, president of Utah Power & Light (above).

Five of the six "natural resources" objectives give prominence to power, and another deals with research and development of shale oil and solar energy.

Among other things, the committee is recommending a Council of Natural Resources Advisers in the office of the President. They also want:

- Atomic energy development under strict government supervision.
- A regional agency similar to TVA for the Pacific Northwest.

In his comments on the Democratic policies, Naughton compared it to a plank adopted by the Socialist party in 1928.

The 1928 Socialist plank, he said, advocated nationalization of our natural resources and establishment of "a publicly-owned giant power system under which the federal government shall cooperate with the state and municipalities in the distribution of electrical energy at cost."

In the case of water development, one of the few natural resources mentioned in the platform, the Columbia Basin, is the only specific reference, and a general reference states, "To develop hydroelectric resources to assure maximum multipurpose use of water resources." See the complete plank below.

In a separate paragraph following the six objectives, the committee states:

". . . at one time we enjoyed international prestige for our nuclear leadership. We pledge protection of the atomic investment as part of the public domain. We oppose patent monopoly in this field. We support federal construction of atomic power plants."

C. Girard Davidson, chairman of the committee and Democratic national committeeman from Oregon, said the proposed Council of Natural Resources Advisers would be appointed by the President and would function in the pattern of the Council of Economic Advisers. It would prepare an annual report on natural resources as part of long range planning efforts by the party.

Davidson also said the "natural resources" plank would serve as "a handbook for Democratic candidates in 1960 in the West for state legislatures, for governorships and for Congress.

"These studies will undoubtedly also be drawn upon by our candidates for president and vice president and will be a guide for the new Democratic Administration that will take office in 1961."

The committee recommendations evolved from studies by more than 100 persons from 13 Western states. They have been at work for about a year and a half preparing what became the natural resources plank.

### Western Democrats' Platform on Power and Resources

The platform as it applies to energy lists six main objectives, which follow:

**1.** To foster development of "efficient regional giant power systems from all sources, hydro, thermal, and nuclear, with utility responsibility to supply low-cost electricity at wholesale to all retail electric systems—public, private, and cooperative."

**2.** To develop hydroelectric sources to assure maximum multipurpose use of water resources.

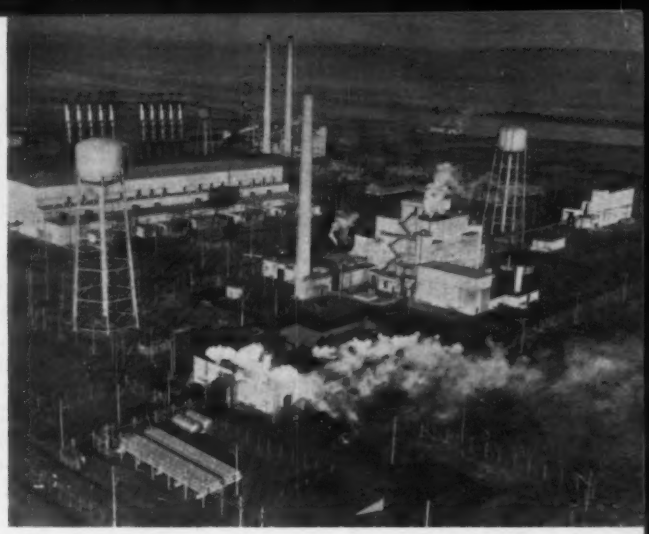
**3.** To provide "full support for 'yardstick' competition in the otherwise monopolistic power industry through continuation of low-interest-rate loans to rural electric cooperatives for distribution, transmission, and generating facilities, enforcement of the anti-monopoly preference clause in marketing Federal power, and cooperation with local public and cooperative systems in utilizing Federal transmission facilities to provide efficient power supply."

**4.** To establish in the Pacific Northwest a regional agency to develop fully the Columbia River and provide the region's utilities with low-cost wholesale power.

**5.** To support continued research in conventional fuels, including oil shale deposits, and in the new fields of wind and solar energy.

**6.** To support "the highly successful conservation and electric power programs of TVA."

**SHIPPINGPORT** nuclear plant may get a $4-million heat sink to provide means of dissipating steam above plant's capacity



**HANFORD** reactor installation may get 700,000 kw as the result of conversion of thermal capacity to electrical capacity

# '202' Spotlight on Shippingport, Hanford

The joint Senate-House Atomic Energy Committee has just concluded the first week of hearings to authorize appropriations for the Atomic Energy Commission's $169-million construction program for fiscal '61.

AEC spokesmen, led by Chairman John A. McCone, proposed $40 million for atomic weapons projects, while new projects asked for under the Reactor Development Program amounted to 43% of the total cost, or $73 million. Projects in support of AEC's physical research and biology and medicine programs represented $23 million, and the remaining $34 million was applicable to general plant projects covering all AEC establishments.

Admiral Hyman Rickover endorsed the AEC's proposal for installing a $4-million heat sink at Shippingport. This facility would provide means for dissipating steam above the plant's present 100-Mw generating capacity in preparation for the 150-Mw second reactor core now being installed. With Rickover's backing, Rep Chet Holifield has pledged the committee's support for both the heat sink and the $5-million second core for developing additional information on lifetime of natural uranium fuel elements.

It was also indicated by committee members that when the hearings resume on committee sponsored projects on April 5th, a natural uranium heavy water moderated civilian power reactor will be proposed as well as legislation providing for the convertibility of 700,000 kw of electrical capacity from the thermal capacity of the nuclear production reactor now under construction at Hanford, Wash.

Senator Henry Jackson (D-Wash.) endorsed a proposal for the Navy to build five small scale nuclear power plants for U.S. bases in Antarctica. Over their 20 year life expectancy, Jackson said that 1500-kw nuclear plants could cut the cost of power, light and heat at the South Pole to one-fourth the cost of conventional plants.

Jackson, who's been to Antarctica, pointed out that transportation costs for fossil fuels is responsible for the high cost of conventional power. He said it takes 4,500 gal of airplane fuel to get 800 gal of fuel oil to location.

## Siemens Grants Power Loan to Mexico

Siemens Electric of Germany has made a $50-million, 10 year, 6% loan to the Mexican Federal Electricity Commission for construction of a new thermal electric plant and general reconstruction of electrical facilities.

Mexico will use the Siemens equipment to build a plant in the Poza Rica, Mexico's oilfield area at a cost of about $24 million.

The Poza Rica station will include three 37.5-Mw steam turbine-generators, and will be part of a $960-million, 2,500-Mw expansion planned for the next five years.

The loan is part of $150 million Mexico has acquired in long term foreign loans and credits—all from private sources. Mexican financial circles were first rocked with the news that Prudential Insurance Co had purchased $100-million worth of Nacional Financiera (Government Development Bank) debentures for 15 years at 6⅞% on the unpaid balance, with amortization starting after five years. The loan was not earmarked for anything special, but officials say it will be spent for petrochemicals, steel, railroads, and electrical equipment.

The Siemens transaction was arranged by a new company called Intercontinental that has Siemens, Krupp, Charles Allen (New York), Mexicans and others abroad as investors.

# PUD's Cloud High Mountain Sheep

**Fish problem still unsolved as 13 Washington PUD's file application for Nez Perce. The action delays PNP's High Mountain Sheep hearings at least until April 4. Others will comment**

A dramatic, 11th hour filing of a license application to build the huge Nez Perce hydro power project on the Snake River last week threw a monkey wrench into Federal Power Commission hearings on the proposed High Mountain Sheep Dam.

The Nez Perce site is just three miles below High Mountain Sheep, so the approval of either dam would permanently block the other. The High Mountain Sheep license application had been scheduled for hearings to start March 21, but these have been delayed until April 4, "or until such further time as may be ordered."

The Nez Perce filing was made by 13 public utility districts in the state of Washington, organized as the Washington Public Power Supply System. It claims 118,000 customers and $82-million assets.

Their plan for Nez Perce calls for a 700-ft concrete arch dam on the Snake River 2.5 miles downstream from its confluence with the Salmon. The dam would have an initial power capacity of 1.2-million kw, an ultimate capacity of 2.4-million kw. It would store a maximum of 6-million acre-feet of water (4.5-million acre-feet allotted to power and flood control) in a lake covering 29,600 acres. The dam would cost an estimated $276.5 million, exclusive of fish facilities.

Nez Perce would back water up the Snake, Salmon and Imnaha rivers, while the High Mountain Sheep Dam—located just above the Salmon's entry into the Snake—would back water up only the Snake and Imnaha. On this point—migratory fish passage up the Salmon River—Nez Perce is not complete. The High Mountain Sheep applicants, Pacific Northwest Power Co, chose their site because it didn't block the Salmon. Nez Perce supporters, however, hope that a special "crash program" for federal fish studies will solve their problem in time to permit construction of the Nez Perce dam. The PUD's oppose Sen Frank Church's bill (S-2586) to prohibit any new dams across the Salmon River until satisfactory fish facilities can be developed, since this would prevent approval of Nez Perce.

The Washington PUD group cites seven reasons why Nez Perce is a better project than High Mountain Sheep:

**(1)** It is "the most attractive undeveloped project in the U. S.," according to both the FPC and Army Engineers;

**(2)** It embraces the largest single block of undeveloped power in the Northwest, and "by far the lowest-cost power remaining for development;"

**(3)** "A need exists for non-federal financing" of such a project in the area in order to keep a balance between federal and non-federal projects in the Northwest;"

**(4)** The PUD plan would provide "equitable geographic power distribution"—regionally shared power;

**(5)** Nez Perce should encourage federal studies to solve the migratory fish problem, although High Mountain Sheep is cited as "a serious barrier;"

**(6)** Nez Perce is "clearly and unmistakably far superior" to High Mountain Sheep with "twice the rated power capacity and usable storage for only 25% more investment." The Army Engineers listed Nez Perce's benefit-to-cost ratio as 3.21-to-1, while High Mountain Sheep is 2.32-to-1;

**(7)** International Joint Commission studies show that water storage is a premium commodity in the Northwest: the more U. S. storage, the less dependence on Canada.

The Washington PUD's claim they are legally entitled to file for the Nez Perce license, and have petitioned the FPC simultaneously to consolidate their application with

### Nez Perce Data at a Glance

**Cost:** (excluding fish facilities): $276.5 million

**Initial power:** 1.2 million kw (six 200,000-kw units)

**Ultimate power:** 2.4 million kw (twelve 200,000-kw units)

**Total storage:** 6 million acre-ft

**Flood control and power storage:** 4.5 million acre-ft

**Dam:** 700 ft high, 585 ft net power head, arch type dam with 3 million cu yd of concrete

**Pool surface:** 29,600 acres

**Drainage area into dam:** 88,700 sq mi

**Average annual run-off:** 22.2 million acre-ft

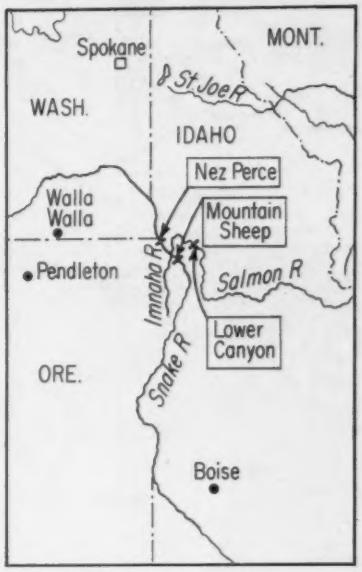
**Average river discharge through dam:** 30,600 cfs

**Average annual power output:** 7,455,000,000 kwhr

**13 Washington PUD's:** Benton, Chelan, Clallam, Clark, Douglas, Ferry, Franklin, Grant, Klickitat, Kittitas, Lewis, Mason #3, and Wahkiakum.

**Dam location:** 2.5 mi downstream from Snake-Salmon confluence.

# With Nez Perce Plan




that for High Mountain Sheep. Their membership includes PUD's in Benton, Chelan, Clallam, Clark, Douglas, Ferry, Franklin, Grant, Klickitat, Kittitas, Lewis, and Wahkiakum counties, plus Mason County PUD No. 3.

Nez Perce would generate an average of 7,455-billion kwhr of power annually. Power would be made available to public, private utilities and industrial customers on a long-term basis—the same as at Priest Rapids Dam. The project would be financed by tax-exempt bonds.

The proposed High Mountain Sheep Dam is estimated to cost $178 million, generate a maximum of 1.75-million kw, back up 3.6-million acre-feet of water in a 17,200-acre lake. It follows recommendations of the Army Engineers in their recent report to Congress on the Columbia River. The Engineers chose High Mountain Sheep over the Nez Perce site because of the fish problem on the Salmon River. Pacific Northwest Power has pointed out in its application that, if and when fish problems are solved, they could build the Lower Canyon Dam on the Salmon—and the two projects would back up as much water, generate as much power as Nez Perce.

Views of the Interior Department will be submitted to the FPC about April 1. These comments—aimed at the High Mountain Sheep project—will cover power, recreation, transmission lines, but will concentrate on fish. Oregon's Water Resources Board—an intervenor in the High Mountain Sheep hearing—has just come out in favor of the PNP project. Other intervenors include the Oregon and Idaho Public Utilities Commissions, Oregon Game and Fish Commission, Washington Departments of Game and Fisheries, Idaho Fish & Game Commission and Department. While these groups filed originally on Mountain Sheep, they undoubtedly will want to give their views on Nez Perce.

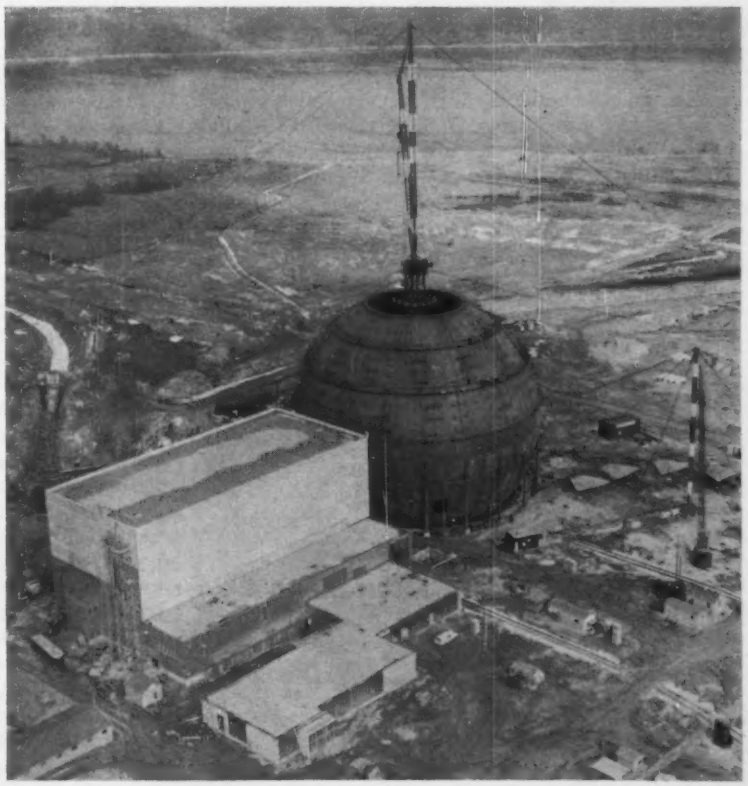
Another delay on a High Mountain Sheep license is coming from Oregon's Hydroelectric Commission, which wants engineering consultation on design.

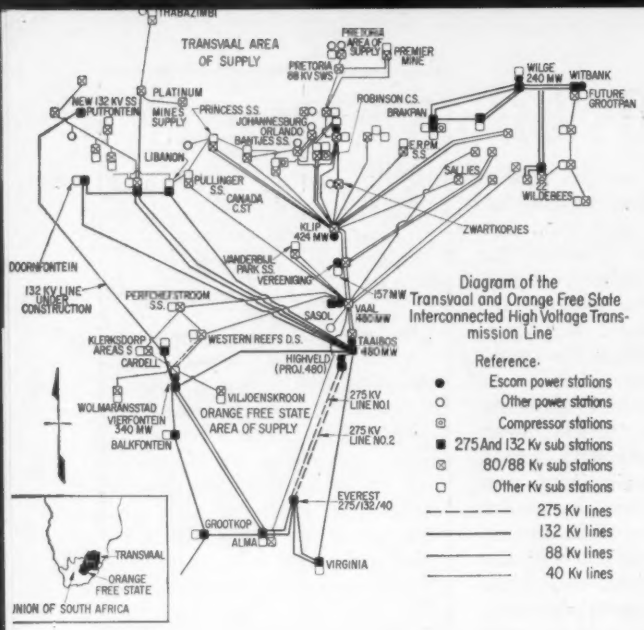
## Dresden Fuel Loading Progresses Uneventfully

Commonwealth Edison Co has announced that fuel loading at Dresden Nuclear Power Station is about two-thirds completed with 320 elements now installed. (The picture to the right shows Dresden during construction.)

The loading program was suspended twice, in November and again in December, for correction of mechanical problems associated with the plant's control rod drives.

During February, critical tests were made with 144, 256, and 320 fuel assemblies in the reactor. There were no difficulties. Edison and General Electric Co estimate that four to eight more weeks will see the end of fuel loading and the beginning of low-level tests. At this point the reactor pressure vessel will be closed, steam will be made for the first time, and further testing will continue until the plant is brought up to one-half power as authorized by the Atomic Energy Commission.






- **Reserves are building for what could develop into a boom during the 1960's**
- **Railroads are already big users of electric power and their use could double soon**
- **A wealth of coal deposits place atomic energy development far into the future**

# Electricity—Lifeline

The power situation in South Africa is more favorable now than at any time since 1882 when the first generators began to serve the diamond town of Kimberley.

In the first decade after the war's end, production lagged behind consumer demand created by acceleration of manufacturing industry and new mining projects. This backlog has been wiped out in the last four years, however. Reserves are being built up to meet a consumption surge in the Sixties—a period of boom potential.

Sales figures of the Electricity Supply Commission show a present flattening-out of demand. Total sales by Escom, which fulfills 82% of the Union's power requirements, rose last year to a record 18.1-billion kwhr. The increase was 5.2% over the 1958 figure. The mining industry—Escom's largest customer—took 10.8-billion kwhr in 1958, which represents a 7% increase over 1957. Figures for '59 are not available.

Meanwhile a progressive improvement of power reserve boosted total capacity to 4,533 Mw at the end of 1958. This is 50% above the capacity of 1953. Escom had jurisdiction over 3,100 Mw of the total, municipalities account for 1,200 Mw, and the South African Railways generates a small amount of power for remote areas.

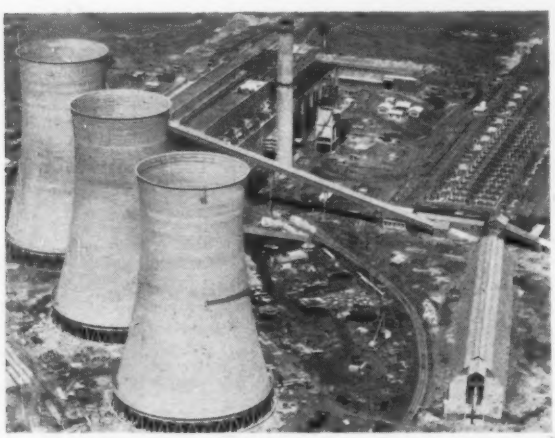
South Africa is by far the largest power consumer in the continent. Development started, in the modern sense, in 1922 with enactment of the Electricity Act. This provided for appointment of the Electricity Control Board and creation of Escom.

The commission is not a state department but a corporate body free from parliamentary control and influence, except that members are appointed by the government. It is required to operate on a non-profit but also on an economic basis.

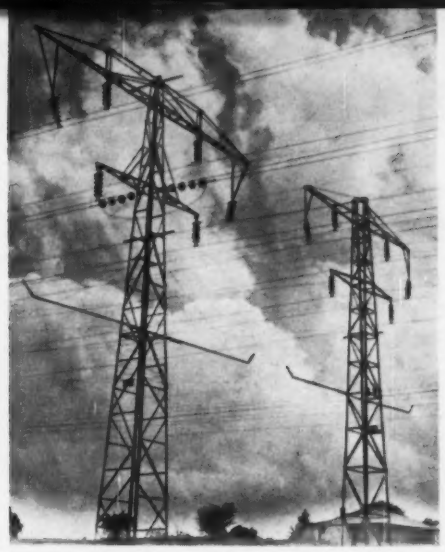
Escom received money from the state during the first seven years in the form of Treasury advances which were subsequently consolidated into loans. Since then most of its capital—including enough to repay the state's loans—came from within the Union by issue of local registered stock.

About 99.8% of the Union's output is steam generated. Tremendous reserves of low-grade coal and the lack of perennial rivers are the reasons for the concentration. Coal prices range from a high of $9.40 a ton in areas remote from the pithead to $1.12 at some mines in the Vaal Basin area of the Transvaal and Orange Free State. This means the average price for power sold by Escom is fractionally under 0.6¢ per kwhr as compared with .92¢ charged by Hydro-Electric Power Commission of Ontario, the British price of 1.6¢, and 2.4¢ in Queensland, Australia.

Over 300 power stations are in the Union. Escom operates 20 major plants in the four provinces. These and three others under construction will establish a capacity of 3,521,550 kw. About 85% of this will be in the coal-rich Vaal Basin.



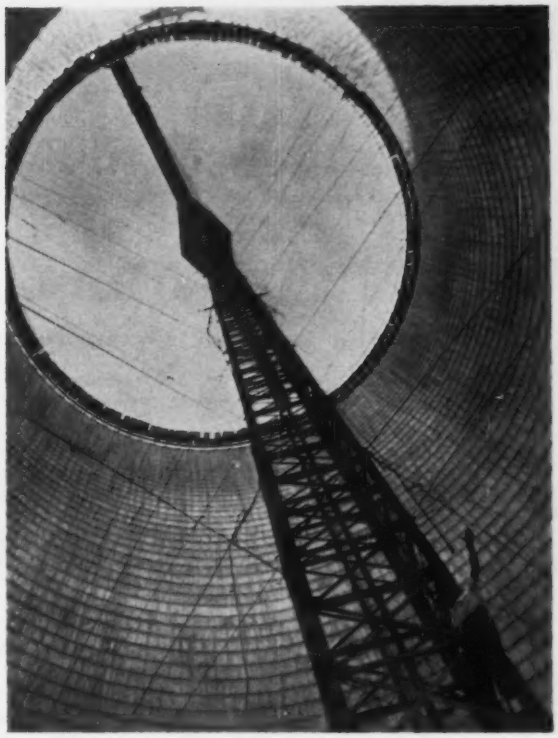
**MUNICIPAL PLANT** at Kelvin, north of Johannesburg, will supply 33,600 kw. South African Union has over 300 power stations with total capacity approaching 3.5-million kw



**TRANSMISSION IS AT 275 KV** or lower in the 1500 miles of lines in the Union's grid

# of South Africa

**LOOKING UP** through a 307-ft cooling tower at a Johannesburg municipal plant. External view on opposite page



The largest power station in the Union is Taaibos in the Orange Free State. Completed in 1958, it has eight 60,000-kw turbine generators, the largest sets operating in the Union at present. It will serve a portion of an area rich in iron ore deposits, gold producing mines, and a sprawling industrial complex.

Another station, Vierfontein, produces 360,000 kw. It is a mine-mouth project about 120 miles from a vast state oil-from-coal project at Sasolburg. Komati station is the centerpiece of the Eastern Transvaal where coal reserves are expected to last hundreds of years. The Komati site involves a 40-mi pipeline from the river but savings in transmission lines will recoup this expense.

Two hydrogen-cooled turbo-alternators of 100,000-kw capacity, with two 900,000 lb/hr boilers, will be installed at Komati. Boiler design calls for 1,250 psi at 950F. The first of ten of these sets will be on the line in 1961 and last should be in operation about 1972. Total cost will be $154 million.

A third major coal area is Northern Natal. Within another two years a plant near Newcastle will begin producing 500,000 kw for the Natal grid. An ambitious railway electrification scheme is bringing a 60,000-kw addition of the Hex River plant in Cape Town.

The Transvaal and Orange Free State plants are interconnected in a grid including 1,500 miles of 275 kv and lower voltages.

Present capacity is adequate and extra requirements for the next three years will also be met as most installations in the current program will be operational by then. But there must be much imaginative planning to provide for another big step forward in the Union's development after that.

This forecast is based on expectations of continued expansion of secondary industry and rail transport, new mining developments, and a greater usage of power by European and non-European households. A survey taken recently in selected sectors of industry showed a strong trend towards increased factory output. The protection and encouragement of the Union's domestic industries is a powerful plank in the program of the present government.

The product of the country's factories has soared in last ten years from about $1,560,800,000 to a figure above $4,480,000,000. By 1963 the capacity of the country's manufacturing plants may be increasing at between 7 and 8% a year—and the demand for power in the industrial sector at a comparable rate.

The railway, almost a world pioneer in the use of electric traction, has 11.4% (or 871 route miles) of its rail network electrified and buys about 200-million kwhr annually from Escom. Short term plans call for 674 more route miles of track. Demand on bulk power from this direction may well double.

Agriculture is the only industry where a greatly increased demand for power in the forseeable future is not envisaged. Of the total units sold only about 1% is consumed by farmers.

On the domestic side the future power picture is bright. European householders in the Union are already extensive users of electrical appliances and most modern apartment houses have substations of impressive capacity.

Atomic power is under consideration but will not be introduced before 1968 or 1970 at the earliest.

# Some Firms to Fight Anti-Trust Actions

## They file 44 'not guilty' and 26 'nolo contendere' pleas; government moves to have latter rejected. March 24 hearing set

A total of 44 "not guilty" and 26 "nolo contendere" pleas were entered by electrical manufacturing firms and individuals in arraignments in seven anti-trust indictments brought against them. There were no "guilty" pleas.

Arraignment took place in Philadelphia last week (March 16) before Federal District Judge J. Cullen Ganey. Five of the companies—General Electric, Westinghouse, Hubbard, McGraw-Edison and Southern States Equipment—entered "not guilty" pleas on all counts against them. Allis-Chalmers entered "nolo contendere" pleas on all counts against it.

### Pleas in Anti-Trust Case Arraignments

**Power Switchgear Assemblies**
- Westinghouse—Not Guilty
- Allis-Chalmers—Nolo Contendere
- Federal Pacific—Nolo Contendere
- General Electric—Not Guilty
- I-T-E—Nolo Contendere
- L. J. Burger (GE)—Not Guilty
- G. E. Burens (GE)—Not Guilty
- C. E. Burke (GE)—Not Guilty
- G. R. Fink (GE)—Not Guilty
- Landon Fuller (W)—Not Guilty
- H. F. Hentschel (GE)—Not Guilty
- Houston Jones (GE)—Not Guilty
- L. W. Long (AC)—Nolo Contendere
- F. M. Nolan (AC)—Nolo Contendere
- A. W. Payne (W)—Not Guilty
- F. E. Stehlik (GE)—Not Guilty
- J. T. Thompson (W)—Not Guilty
- D. W. Webb (AC)—Nolo Contendere

**Oil and Air Circuit Breakers**
- General Electric—Not Guilty
- Allis-Chalmers—Nolo Contendere
- Federal Pacific—Nolo Contendere
- I-T-E—Not Guilty
- Westinghouse—Not Guilty
- C. E. Burke (GE)—Not Guilty
- R. C. Crawford (GE)—Not Guilty
- L. W. Long (AC)—Nolo Contendere
- W. H. Schiek (GE)—Not Guilty
- J. W. Stirling (W)—Not Guilty

**Low-Voltage Power Circuit Breakers**
- General Electric—Not Guilty
- I-T-E—Nolo Contendere
- Westinghouse—Not Guilty
- R. W. Ayres, Jr (GE)—Not Guilty
- W. T. Pyle (W)—Not Guilty
- F. E. Stehlik (GE)—Not Guilty
- J. T. Thompson (W)—Not Guilty

**Lightning Arresters**

(Count One—Distribution)
- General Electric—Not Guilty
- McGraw-Edison—Not Guilty
- Hubbard—Not Guilty
- Joslyn—Nolo Contendere
- H. K. Porter—Nolo Contendere
- Ohio Brass—Nolo Contendere
- Westinghouse—Not Guilty

(Count Two—Intermediate & Station)
- General Electric—Not Guilty
- Ohio Brass—Nolo Contendere
- Westinghouse—Not Guilty

(Count Three—Arrester-Cutout Combinations)
- General Electric—Not Guilty
- Hubbard—Not Guilty
- Joslyn—Nolo Contendere
- McGraw-Edison—Not Guilty
- Westinghouse—Not Guilty

**Insulators**
- Ohio Brass—Nolo Contendere
- General Electric—Not Guilty
- Lapp—Nolo Contendere
- Porcelain Insulator—Nolo Contendere
- I-T-E—Nolo Contendere
- A. B. Chance—Nolo Contendere
- McGraw-Edison—Not Guilty
- H. K. Porter—Nolo Contendere

**Bushings**
- Lapp—Nolo Contendere
- General Electric—Not Guilty
- Ohio Brass—Nolo Contendere
- Westinghouse—Not Guilty

**Open-Fuse Cutouts**
- A. B. Chance—Nolo Contendere
- General Electric—Not Guilty
- Hubbard—Not Guilty
- I-T-E—Nolo Contendere
- Joslyn—Nolo Contendere
- McGraw-Edison—Not Guilty
- Southern States—Not Guilty
- Westinghouse—Not Guilty

Justice Dept attorneys moved immediately to have the "nolo contendere" pleas thrown out. Judge Ganey said he usually accepted such pleas, unless there was a special reason not to. Department lawyer William L. Maher, who has been handling the case, said there were special reasons, and a government memorandum was being prepared which would cite such reasons for rejecting the "nolo" pleas.

Judge Ganey set Thursday, March 24 at 4 p.m. as the date and time he will hear arguments on the government's motion. Maher said the memorandum will be circulated to defendants in advance of the March 24 hearing. Several company lawyers were prepared to argue the "nolo" pleas at the arraignment, but the government declined. The attorney for Federal Pacific Electric Co argued that the plea should have been accepted at the Wednesday arraignment.

### Westinghouse Asks Delay

Westinghouse's lawyer, in entering "not guilty" pleas, asked that trials not be scheduled until the grand jury's current investigations are completed. The company's counsel said that "We're ready to go to trial on any date you fix," but pointed out that witnesses are still being subpoenaed, and it would be difficult for Westinghouse to determine what is "germane" to the cases. Maher objected on the ground that the present grand jury probe had nothing to do with the product groups involved in these indictments. Judge Ganey concurred.

Attorneys for McGraw-Edison asked for 30 days in which to file pertinent motions, including petitions for a more accurate bill of particulars. Normal time allowed is 10 days; however, Judge Ganey allowed defendants 20 days. All motions and petitions must be filed by Monday, April 4.

The filing of a special memorandum in the matter of "nolo contendere" pleas represents a departure from government policy. Previously, government lawyers have been content in these matters to file an immediate and brief protest, which usually has been overruled.

**MODERN MOBILE UNIT SUBSTATION** has these items mounted on a semi-trailer: Transformer, Type FOA-TU, rated 7,500 Kva, 22,900 x 34,400-v to 13,200Y-v; hv disconnect, lightning arresters, fuses and circuit breaker

# Sub Tolerates Heavy Loading

## Today's mobile unit for emergencies can accept even 1% loss of life per overload at an unattended substation

**G. E. SAUER,** Apparatus Transformer Design Engineer, General Electric Co, Pittsfield, Mass.

Mobile unit substations are emergency equipment, not continuously loaded, and consequently can tolerate a greater loss of life for daily overloads than ordinary substation transformers. Normally, a 1% loss of life per overload is considered tolerable.

### Usually Unattended

Mobile unit substations ordinarily operate in unattended substations, where it is usually desirable to trip the breaker when a prescribed overload condition is exceeded; that is, when a tolerable amount of life has been taken out of the unit.

For such an application, a thermal overload relay with alarm and breaker-trip contacts is recommended.

A typical modern, 5,000-kva, mobile unit substation is illustrated above. Its overload relay set for 1% loss of life permits overloads following full-load operation in a 30C ambient as shown by the lower curve in Fig 1. In this drawing the upper curve is for an older, 1,500-kva unit.

The appreciable difference between the curves is explained by the larger amount of oil in the smaller unit, which affords more thermal capacity and a longer time constant than those of the larger unit.

The curve for a higher-voltage, 5,000-kva mobile unit substation transformer would lie between these curves which, in fact, reasonably well bracket the permissible overload characteristics for 1% loss of life for modern mobile unit substations.

Improvements in the unit substation design to permit more capacity within the prescribed weight limitations tend to lower the overload curve. For the transformer overload capability is somewhat proportional to the transformer weight per kva of rating.

### Aging Retarded

The aging characteristics of transformer insulation are greatly improved by initial, thorough drying and maintenance of this dryness for the life of the transformer. Insulation loss of life for today's transformers is about 40% of that given

in the ASA loading guides. Thus, the overload curves of Fig 1 represent only 0.4% loss of life rather than 1%.

### Ups Overload Capability

When the curves are redrawn to represent 1% loss of life for modern transformers (that is, 40% of 2.5% loss of life as defined by ASA), the curves of Fig 2 result. The improved insulation drying thus increases the overload capability by as much as 10%.

Knowledge of overload capacity helps an operator in purchasing mobile unit substations. It allows him to decide to buy a lower-capacity unit, thereby sacrificing some insulation life, or to consider that the highest kva obtainable for this application is enough for the loading conditions encountered. He may come to the latter decision even though the mobile unit substation transformer rated capacity is lower than that of the substation transformer for which it is substituted temporarily.

### Determined Easily

Once the mobile unit is installed, its loss of insulation life during an overload period can be determined easily from the percent load and time duration. As it is not always convenient to monitor the load so precisely, the anticipated loss of life may be exceeded. But overload relays monitor the load continuously, so the operator can be assured that his mobile unit substation does not age more rapidly than he would ordinarily permit.

### Connected to CT

The overload indicator-relay is similar to other winding temperature devices in having a heater-well immersed in the transformer top oil and connected to a current transformer (usually installed on a lead of the low-voltage winding). The temperature-sensing bulb, which is inserted into the well, operates the indicator-relay instrument by liquid pressure transmitted through a capillary tube.

The indicator-relay instrument is provided with a pointer which indicates proximity to trip temperature on a dial.

The instrument also includes three electrical switches. One is used to trip the breaker when a prescribed loss of life, as defined in the ASA Loading Guides for Transformers (C-57.92), is reached. A second switch is connected to sound an alarm. This switch functions at approximately half the loss of life permitted by the breaker-tripping switch.

But the third, lowest-temperature switch usually is not used for mobile unit substations but is available for starting cooling equipment on transformers which do not have continuously-operating cooling equipment.

### Permits Some Loss

The heater-well has a much greater thermal capacity than those commonly used with winding temperature devices, resulting in a time delay before closing the switches. This permits a prescribed loss of transformer life for each overload in any ambient temperature normally encountered.

As high, short-time overloads are most frequently encountered, and other means normally exist for monitoring long-time overloads, the relay is calibrated to function for overloads persisting from a few minutes to approximately four hours in duration.

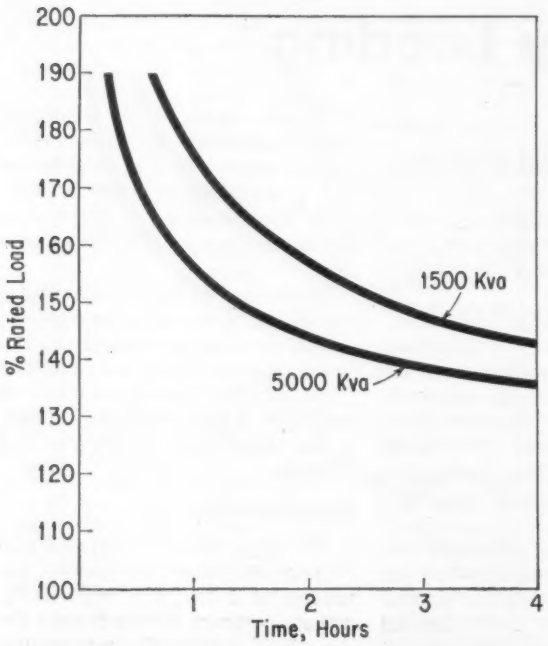



FIG 1—**LOAD-TIME CURVES** of a mobile unit substation transformer for 1% loss of life after full load in 30C ambient

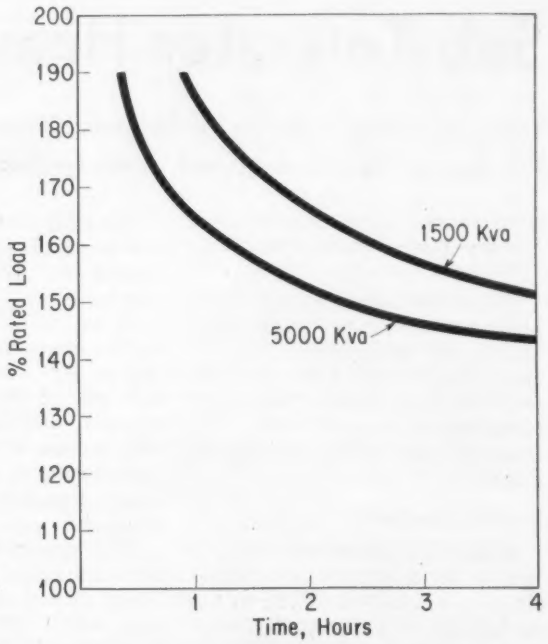



FIG 2—**LOAD-TIME CURVES** for unit transformer with insulation dried by modern methods under conditions as in Fig 1

# River Intake Cools Dickerson

## Circulating water scheme for Unit 1 will be extended to Unit 2, but Units 3 and 4 may need cooling towers as well

**R. D. CHELLIS** and
**E. IRELAND**, Structural Engineers, Stone & Webster Engineering Corp, Boston, Mass.

River intake discharging by open flume to the river was installed at Potomac Electric Power Co's new Dickerson Station on the Potomac for Unit 1, completed in 1959, and for Unit 2, scheduled for completion this year. Data from the operation of both units will help PEPCO decide whether to extend it further.

This scheme's adoption was based on studies of available water, other circulating water systems, and power plant design. River intake proved most economical, at least until Unit 3 will be completed. This conclusion helped the utility to select the station site, 35 miles north of Washington, D.C.

Dickerson, a coal-burning steam power plant, initially consists of two 1,300,000-lb-per-hr boilers operating at 2,486 psig at superheater outlet and a temperature of 1,050F with 1,090,000 lb reheated to 1,000F, and two 175-Mw cross-compound, single-flow turbine generator units. Its designers assumed that enough water could be diverted from the Potomac to cool two units without much recirculation, and model tests confirmed this assumption. The studies showed that cooling towers, along with the river intakes, might be needed for Units 3 and 4 and later units. Space was accordingly allocated.

The design specifies a separate circulating water system for each unit, from intake to common dis-

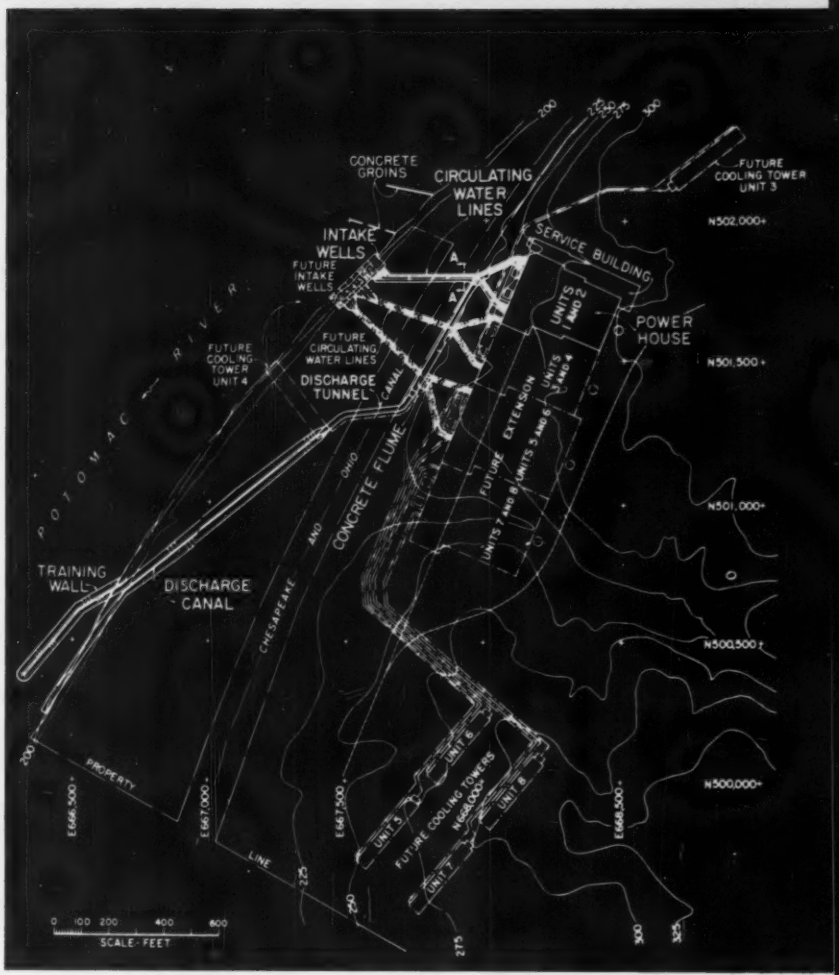



**FIG 1—CIRCULATING WATER SYSTEM** as planned for Dickerson Station consists initially of river intake only, but may include towers for future units

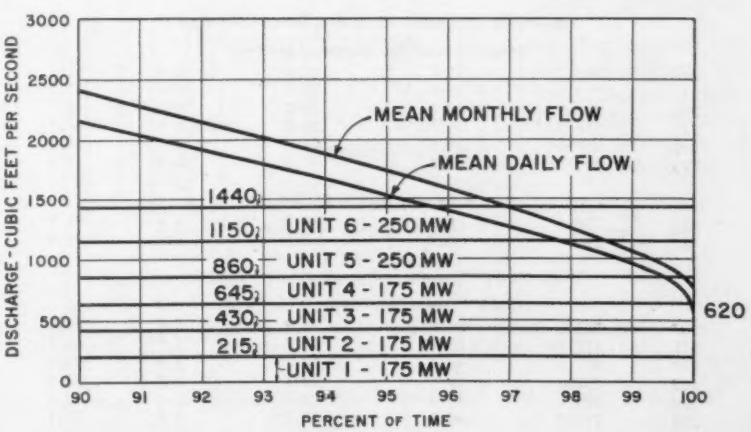



**FIG 2—FLOW-DURATION CURVE** shows the mean monthly and daily flow from the Potomac compared with the steam power plant's circulating water needs

charge flume, and yard space was provided for this arrangement. Underground installations were placed where they will not interfere with later construction.

Studies of flow rates at the plant site showed variations from 620 to 482,000 cfs with corresponding water levels of El. 190 and 230. The maximum 500-year frequency of flood predicted by the U.S. Corps of Engineers is 700,000 cfs at surface El. 242. At normal stages, the river is shallow, about 1,000 ft broad, and has a generally level, rocky bed. The mean monthly flow varies from 780 to 76,000 cfs, the average monthly flow being 10,500 cfs. Some low daily flows will not meet the cooling needs of four or more station units, but fortunately occur only briefly. The Corps of Engineers may build a dam downstream which might raise a 700,000-cfs flood to El. 250 at this site.

The upper curve of Fig 2 shows mean monthly flows recorded between 90 and 100% of the time; the lower curve, the flows plotted from records for the range between 98 and 100% and extrapolated to 90% of the time. This lower curve shows that the minimum daily flow available 100% of the time is 620 cfs. Three 175-Mw units need about 636 cfs. This theoretical scarcity occurred one day in the 44 years of record.

Hence, Unit 4 would have full flow available 99.7% of the time. On the assumption that Units 5 and 6 would be 250-Mv capacity each, full flow would be available 95.7% of the time for Unit 6; that is, on all but the equivalent of 16 days a year.

### Rock Excavation Cut

Boiler room floor levels, the designers found, could be raised or lowered to bring the condenser floor between El. 223 and 247 to minimize rock excavation. Table I gives operating data for one-pump and two-pump operations and the required elevations of water seals at the discharge flume for particular condenser floor elevations. El. 235 was selected as the base for starting the design drawings.

Cost varied insignificantly for Units 1 and 2 between El. 235 and 247, the former level costing less. Between El. 232 and 235, Units 3 and 4 costs varied little, the latter elevation being the cheaper. El. 232 appeared to cost slightly less than El. 235 for Units 5 and 6 considered alone and operating on intakes only for an assumed 90% of the time. As El. 235 proved to be most economical for all combined units through Unit 6, it was retained in the final design.

At some stage of station development, cooling towers will be needed to maintain station output at maximum capacity. They could take over temporarily for intakes suffering an occasional cool water shortage, or they could provide the entire circulating requirements. In the latter arrangement, intakes could be discarded.

Cooling towers can be on a closed or an open cycle. Hot water in an open cycle would be taken from the open flume, cooled, and discharged into the river near the intake. This arrangement would augment the cool river water supply, the intake well pumps lifting water to the condensers. Studies of river flow and of the capital and operating costs of intakes, towers, and circulating systems developed the information that guided the plant layout.

River intake systems can be installed and operated at about half the cost of cooling tower systems at this site, where the available cooling tower locations are at high elevations which would require high pumping heads. Closed-cycle systems need long penstocks for water lines in both directions.

Cooling tower costs are also affected by the shorter assumed life, 15 in contrast with 40 years for an intake. Also, except for a very small part of the time, thermal efficiency suffers through the use of a tower.

Yet a combination of intakes and towers is practicable. In it, the more efficient and less costly intakes would operate for as much of the time as possible, and the cooling towers would take over only when insufficient cool river water would dictate their use. For intermittent use of cooling towers, treated wood and fog sprays were included in the estimates. The estimates took into consideration that river flows and the circulating water's amount and temperature would be greater than those in the intakes.

Four circulating water systems for Unit 4 were studied, the arrangements being as follows:

(*Continued on page* 82)

## Table 1—Comparative Operating Data

## Circulating Water System on River Intake Operation

| Elevation Condenser Room Floor | Elevation Seal Well Water Surface | Height, Point of Minimum Pressure in Condenser Above Seal Well Water Surface, Ft | Maximum Negative Pressure in Condenser | Throttling Valve Loss in Head, Ft | Total Dynamic Head on Pumps, Ft |
|---|---|---|---|---|---|
| **Two-Pump Operation—Pumping Rate 96,000 Gpm** | | | | | |
| **Under Present Conditions of No Pool** | | | | | |
| 247 | 225.8 | 31.9 | 29.0 | 0.4 | 61.1 |
| 241 | 219.8 | 31.9 | 29.0 | 0.4 | 55.1 |
| 235 | 213.8 | 31.9 | 29.0 | 0.4 | 49.1 |
| 232 | 210.8 | 31.9 | 29.0 | 0.4 | 46.1 |
| 229 | 207.8 | 31.9 | 29.0 | 0.4 | 43.1 |
| 223 | 201.8 | 31.9 | 29.0 | 0.4 | 37.1 |
| **If Dam Is Built to El. 235** | | | | | |
| 241 | 235 | 16.7 | 13.8 | 0.4 | 24.8 |
| 235 | 235 | 10.7 | 7.8 | 0.4 | 24.8 |
| **Single-Pump Operation—Pumping Rate 59,050 Gpm** | | | | | |
| **Under Present Conditions of No Pool** | | | | | |
| 247 | 223.8 | 40.1 | 28.7 | 5.9 | 52.1 |
| 241 | 217.8 | 40.1 | 28.7 | 5.9 | 46.1 |
| 235 | 211.8 | 40.1 | 28.7 | 5.9 | 40.1 |
| 232 | 208.8 | 40.1 | 28.7 | 5.9 | 37.1 |
| 229 | 205.8 | 40.1 | 28.7 | 5.9 | 34.1 |
| 223 | 199.8 | 40.1 | 28.7 | 5.9 | 28.1 |
| **If Dam Is Built to El. 235** | | | | | |
| 241 | 235.0 | 22.9 | 17.5 | 0.2 | 12.7 |
| 235 | 235.0 | 16.9 | 11.5 | 0.2 | 12.7 |

**New system HQ**

**tests hybird**

**heating system as**

**Western Mass. Electric . . .**

# Evaluates Off-Peak Heat Storage

**JOHN M. TURNBULL,** Director of Industrial Sales and Area Development, Western Massachusetts Electric Co, West Springfield, Mass.

A year-round heating and cooling system that combines the high efficiencies of the heat pump and the economy of the off-peak heat accumulator is one of the unusual features of Western Massachusetts Electric Co's new headquarters building in West Springfield.

The 102-ton heat pump is the minimum size to keep the 73,300-sq ft building comfortably cool in summer. Additional heat needed for mid-winter days in this 6,000 deg-day area is provided by 8,000 gal of 205-F water, heated by two 195-kw electric heaters during off-peak hours and stored in an insulated tank in the basement.

In addition to heating and cooling the building, the system will be used to provide reliable operating cost data and to demonstrate the feasibility of such a system for large commercial buildings in a northern climate. Cost data can then be used to establish favorable but profitable rate structures for commercial users.

To keep initial cost to a level attractive to large commercial users, refinements have been minimized. Changeover from summer to win-

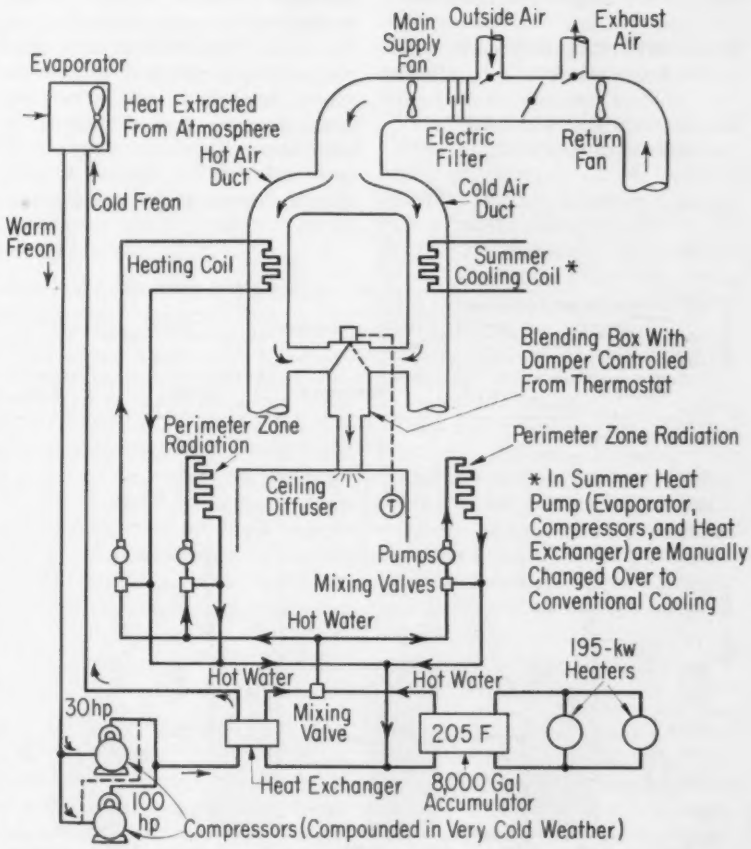



**FIG 1—DUAL DUCT SYSTEM** permits winter heating and limited cooling simultaneously. Heat pump and resistance heater each have six operating levels

**FIG 2—INDIVIDUAL BLENDING** controls for each room or area are adjusted to match heat supply to room needs

**FIG 3—HOT WATER IS STORED** in 8,000-gal tank at rear. Supervisory center, left, controls all heating and cooling

ter operation is completely manual. After two or three years of operating experience, modifications to increase system efficiency will be tried.

The system was selected after a detailed study of fixed charges plus operating costs of alternate heating methods. Comparative costs were:

| | |
|---|---|
| Partial heat pump with partial accumulator | 100% |
| Summer chiller with full winter accumulator | 117% |
| Full heat pump | 134% |

Hot water radiators, supplied from the heat pump and the accumulator, provide heating along the building perimeter to overcome heat loss through the walls. These units are controlled by an outdoor temperature sensing device. Heating in the center of the rooms is provided by circulating air. As indicated on the schematic diagram, Fig 1, air is distributed by a dual duct system, which can provide winter heating to one area and, simultaneously, limited cooling to other areas. The heat supply to any room can thus be adjusted to take into account changes in the number of people in the room, sun conditions, or other variables. Air supply for each room or area is controlled by an individual thermostat and blending control, Fig 2.

The heat pump is a conventional unit, with one 100-hp and one 30-hp compressor, Fig 3. The 30-hp unit has two operating stages; the larger unit, four. With six operating levels, the heat pump can match variations in heating or cooling needs without wasting energy. For winter heating, the compressors can be compounded.

The two 195-kw electric heaters are operated only from 9 P.M. to

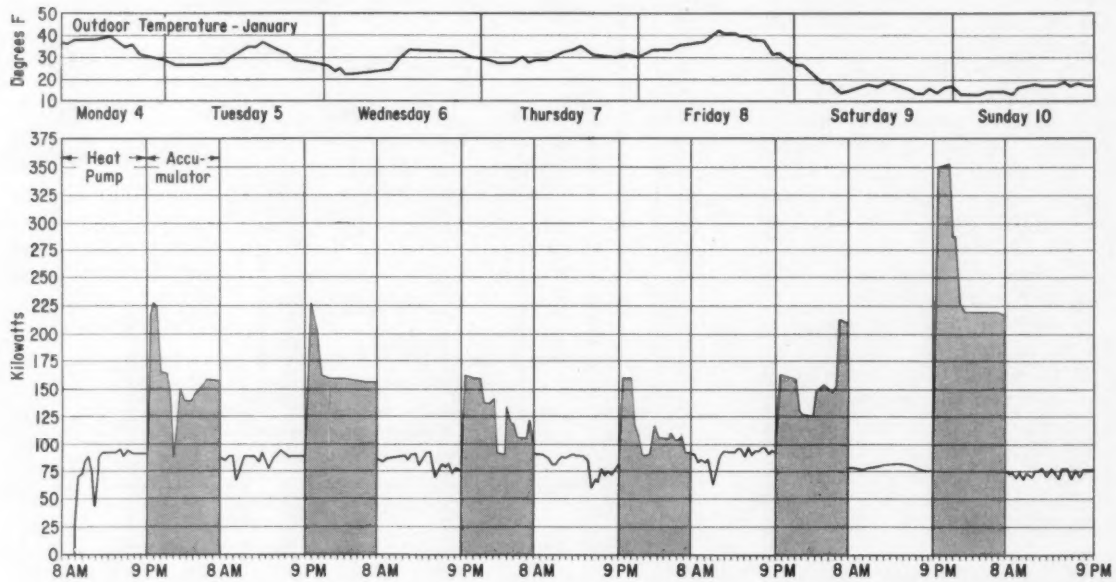



**FIG 4—RECORDING OF POWER USE** in typical January week shows that daytime demand for 73,000-sq ft building does not reach 100 kw, even when temperature is 10 F. Fans and auxiliaries for circulating air use another 50 kw

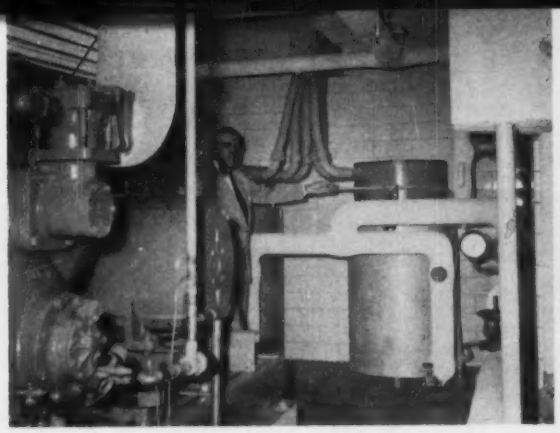


FIG 5—TWO 195-KW OFF-PEAK heaters at rear supply hot water to supplement heat from two compressors at left

FIG 6—CAFETERIA is used for commercial cooking demonstrations. Center doors hide power and water connections

8 A.M. Like the heat pump, the resistance heaters have six operating levels and can be easily adjusted to meet seasonal or daily variations. During the daytime heating period, 205-F degree water is released from the accumulator at a controlled rate to make up the additional heat required by the building.

Input to storage during the 11 hours of changing can carry the building heating load for 13 hr. With the additional accumulator capacity, it may be possible to shut down the heat pump entirely during the afternoon peak, let the accumulator carry the heating load, and thus cut the afternoon peak demand.

Hot water from the accumulator and from the heat pump heat exchanger are blended in a mixing valve with return water from the system to produce 105-F circulating water. This is then circulated to the perimeter radiators and to the heating coils in the hot air ducts.

The entire system is controlled from a supervisory data center, Fig 3, adjacent to the compressors and to the storage tank. Responsibility for its operation rests with the building maintenance supervisor, in addition to his other duties. No other manpower is required.

To obtain reliable data on power requirements and costs, a detailed metering system has been installed. Demand, total kwhr use, and off-peak kwhr use are recorded individually for the heat pump, the accumulator, and the fans and auxiliaries. Actual consumption for Jan 4 to 10, 1960 is shown in Fig 4. Additional demand for circulating the hot air is about 50 kw.

In selecting the system, both single and multiple heat pump units were considered. A single unit was finally selected because it had a lower first and installation costs and and was considered to be reliable enough for this type of service.

If the heat pump is shut down for repairs or maintenance during the heating season, the accumulator can carry the heating load. Since a commercial building is only in use eight hours per day the possible inconvenience of a summer shutdown is small. Moreover, if the shutdown occurs in the afternoon, the building will already be cool. Ventilation can be increased as an emergency measure.

### Building Functional but Esthetic

The new building, completed last fall, brings together administrative, engineering, and accounting personnel formerly scattered in six locations. Located near the junction of the Massachusetts Turnpike and a proposed new interstate highway, the site is only 10 minutes from downtown Springfield, one hour from the most distant district office, and two hours from Boston. Transit to the adjacent Connecticut companies will be equally good. Savings in administrative and engineering personnel travel time along are expected to be significant.

The building houses all personnel with system-wide and staff functions. Departments involved in building and operating local facilities or in customer service are still administered from three division offices under division managers. The site is almost in the center of the service area, based on customer density and very near the relative load center.

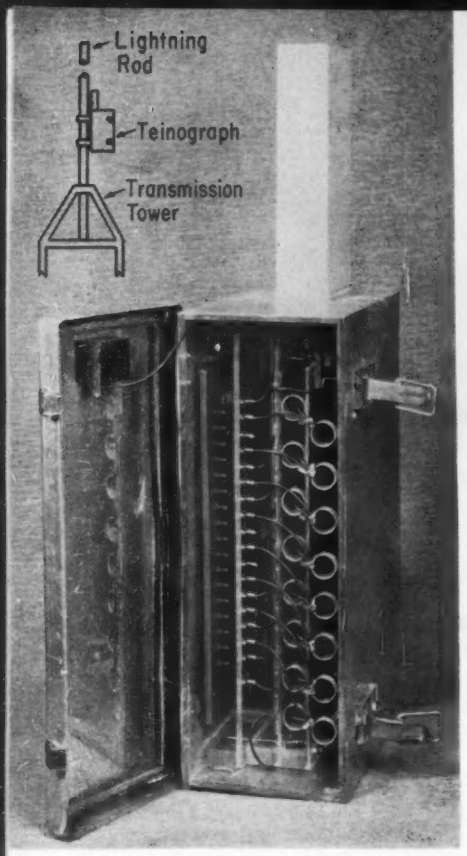
Although the building and its facilities are sized to provide only for needs of the next 10 years the site measures 50 acres and some provisions are included for future additions. These include two expansions of the office building, anticipated for the next 20 years, addition of a central storeroom, and addition of a service center for men whose duties are system-wide.

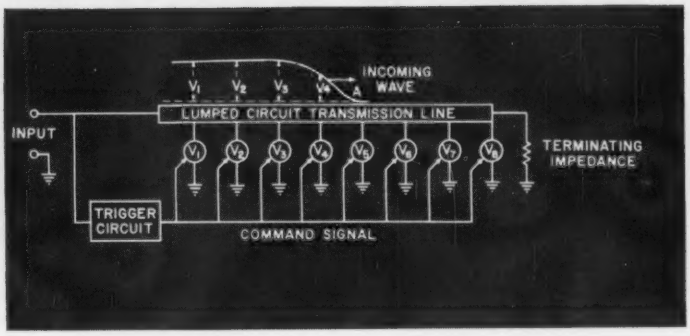
The building was designed to incorporate the best functional aspects of modern design without needless expense for frills. Provision of ample conference rooms allowed the company to minimize space waste in the individual offices and eliminate doors from offices where they were infrequently used.

A large majority of the partitions on the top three floors are movable to provide flexibility for future growth and changes. Building mechanical services, including air ducts, are housed in two vertical service shafts extending from basement to penthouse. The cafeteria and demonstration room are located so that visitors can be brought in without passing through the main working areas.

General lighting intensity is 160 ft-c. Illumination design was based on needs in the drafting room and data processing area, and then applied throughout the building. Recessed fluorescent troffers are used in most of the building, with multiple switching devices in some areas for flexibility. Walls and ceilings are painted to enhance lighting effectiveness and provide a

(*Continued on page* 142)




**SURGE ARRIVES,** voltmeters fire together, record these . . .

**SIMPLICITY OF CONSTRUCTION,** no power supply and no maintenance attention make Teinograph cheap and practical

# Teinograph

## Simple low cost device provides data on wave shape of stroke currents to towers; advanced models under study

**W. S. PRICE,** Electrical Research Engineer, American Electric Power Service Corp, New York City

**J. G. ANDERSON,** Insulation Research Engineer, General Electric Co, Pittsfield, Mass.

A new instrument, the Teinograph, now undergoing field trials uses no power supply or electronic tubes, yet makes direct recordings of the wave shape of lightning currents or high-voltage surges. The success of this instrument should permit much new statistical data to be gathered on the characteristics of strokes to transmission lines and facilitate better predictions of line outage rates.

Last year, 19 Teinographs were installed on towers of the Ohio Valley Electric Corporation's 345-kv system to obtain field data on lightning strokes to lines. These devices were coupled to tower lightning rods as shown in the left figure.

Three lightning strokes occurred in 1959 to towers on which these Teinographs were installed. These are believed to be the first wave-shape records obtained of direct strokes to a transmission line tower. No insulator flashovers were caused by the strokes. The Teinograph record of one of these strokes and the graphs of all three are shown.

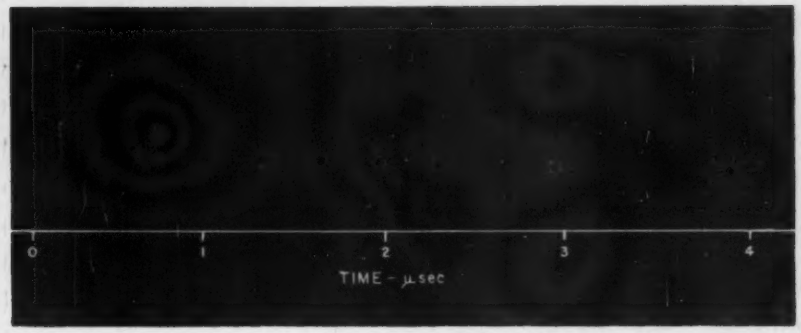
It is planned to install Teinographs on the ground wires and towers of several power systems in the United States. Many records will be necessary before sufficient statistical data will be obtained, but it appears that the Teinograph—and particularly more advanced models now under study—will make a substantial contribution to our knowledge of the characteristics of lightning strokes causing flashovers.

### Better Information Needed

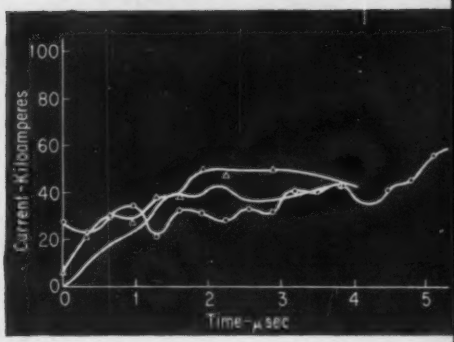
The need for better information about the characteristics of lightning strokes to transmission systems continues as unabated today as it was in the early days of overhead power transmission. Lightning has played a large part in creating suitable insulation levels for electrical systems. Most concepts of system overvoltages are contingent on at least some knowledge of the wave shape and amplitude of lightning current to towers, ground wires, and phase conductors. In spite of a large number of lightning investigations that have been made on lines since 1900, however, good statistical data on stroke current rates of rise, crest amplitudes, and electromagnetic field effects are still missing. This has been due to the widely-scattered statistical nature of the phenomenon, making direct measurement very difficult.

### Stroke at Station Unlikely

A single measuring station can only hope to record stroke surge currents after they have traveled an appreciable distance over a line and have been distorted by corona currents and insulator flashovers. The likelihood of a stroke directly to a recording station is very small unless the station is located on some high structure having a high incidence of lightning. In this case the very fact that strokes are initiated to the recording station at greater than normal frequency makes it appear likely that these strokes may have had their characteristics modified by the height of the structure.




**DISCHARGE PATTERNS** of instantaneous voltages, which are plotted to give . .




**WAVE SHAPE** shown here by triangles

# Catches Lightning's Autograph

Thus the problem appears to resolve into one requiring direct measurements on stricken transmission towers themselves. The magnetic link has been used for this purpose for many years but has the unfortunate characteristic of recording only the current peak amplitude and yielding little or no information about current-wave shape. Even so, some recent work on scale model towers has shown that some fairly large errors may have been made in previous field investigations by assuming how link measurements were affected by division of current among tower legs and braces.

### Compact Device Needed

To get better data on stroke-current wave shape, a new wave shape recording device was therefore needed that could be installed in large numbers on transmission lines. Such a device should consume little or no power, need only occasional inspection to remove records, be easy to install, and inexpensive enough so that a large number could be used to catch the infrequent strokes that occur.

The Teinograph was developed for this purpose. It duplicates to a large extent the functions of an oscillograph in that it records the wave shape and amplitude of a fast current or voltage transient and retains this information for later study. However, it uses no power supply, no vacuum tubes or transistors, has only one moving part, which shorts out the input after a record is made, and needs no attention.

The Teinograph takes an incoming electrical transient, stretches it out spatially on a lumped circuit transmission line, and, at a given instant of time, records the voltage-to-ground at points along the line. The second figure shows a simplified schematic of how this is accomplished. An incoming surge moves along the lumped transmission line inside the Teinograph cabinet. Connected between this line and the Teinograph ground are a sequence of recording "voltmeters" which are so arranged that they do not record the voltage impressed across them until a "command signal" arrives from a trigger circuit. This trigger circuit command signal is delayed until the wave has reached point A or somewhat beyond on the line. When the trigger circuit fires, the "voltmeters" record the voltage at that instant, and by nature of the circuit connections almost immediately cease any further recording.

Therefore by simply reading the "voltmeter" records at a subsequent time the surge wave shape and amplitude can be plotted in terms of these voltages. Obviously ordinary voltmeters are far too slow for microsecond surges and other types must be used. In the field versions of the Teinograph used thus far these "voltmeters" are simple Lichtenberg figure records on a dielectric plate. Such a record is a sequence of high voltage discharge patterns on the plate surface. The diameter of each pattern is proportional to the voltage applied. These "voltmeters" respond at fractional microsecond speeds.

### Cost Cut by $100

Because the Teinograph is a voltage measuring device and to avoid the expense of a lightning shunt to convert the stroke currents to surge voltages, a "pickup coil" attaches to the Teinograph in such a manner that it couples the magnetic fields created around the rod by stroke currents. With a proper choice of circuit constants, the "pickup coil" generates from these fields an output voltage proportional to stroke current. This approach permitted a cost reduction of over $100 per installation in these field trials. Magnetic links were also attached to the lightning rods so that the crest values of stroke currents as measured by the links may be compared with the maximum Teinograph values.

## River Intake Cools Dickerson (*Continued from page 76*)

**1.** River intake only, discharging to river by open flume.

**2.** Cooling tower alone, north of the station, using a closed cycle requiring only make-up water. Sulfuric acid and polyphosphate treatments would be needed for maintenance, but not fog spray. Tower lumber need not be treated.

**3.** River intake with stand-by, closed-cycle cooling tower north of the station. Butterfly valves are required to change the flow from the intake and flume to the tower. Sulfuric acid and polyphosphate treatments and fog spray are required for maintenance. The river intake is inoperative when river water is low. Tower lumber is treated.

**4.** River intake with stand-by cooling tower southwest of the station supported above El. 230 flood level, designed as an open cycle. Prevailing winds blow under as well as over the tower. The tower draws hot water from the common discharge from all units in

### Table II—Comparative Estimated Costs of Cooling Schemes for Unit 4 (Established floor elevation 235 ft)

| | SCHEME I<br>River Intake System | SCHEME II<br>Cooling Tower System, Closed Cycle Tower North of Station | SCHEME III<br>River Intake With Closed Cycle Cooling Tower North of Station | SCHEME IV<br>River Intake With Open Cycle Cooling Tower Southwest of Station |
|---|---|---|---|---|
| **River Intake System** | | | | |
| Intake structure | $442,000 | | $442,000 | $442,000 |
| Mechanical equipment | 164,000 | | 164,000 | 164,000 |
| Electric equipment | 196,000 | | 196,000 | 196,000 |
| Intake and discharge lines and flume | 294,000 | | 330,000 | 308,000 |
| **Cooling Tower System** | | | | |
| Cooling tower | | $500,000 | 532,000 | 532,000 |
| Cooling tower support | | 100,000 | 100,000 | 329,000 |
| Pumps and piping | | 938,000 | 938,000 | 193,000 |
| Electrical equipment | | 408,000 | 408,000 | 414,000 |
| Condenser water boxes, additional | | 26,000 | 26,000 | |
| **Water Treatment Equipment** | 8,000 | 21,000 | 21,000 | 8,000 |
| **Capability Charges (@ $100 Per Kw)** | | | | |
| River intake circulating water pumps (a)—49.1 ft total dynamic head | 97,000 | | | |
| Cooling tower circulating water pumps | | | | |
| North of station (a)—75 ft TDH | | 150,000 | 150,000 | |
| Southwest of station (a)—80 ft TDH | | | | 160,000 |
| Cooling tower fans (b) | | 88,000 | 88,000 | 88,000 |
| Steam turbine generator equipment (c) | 40,000 | | | 97,000 |
| **Capitalized Operating Costs** | | | | |
| River intake circulating water pumps (d)—49.1 ft TDH | 225,000<br>86% (h) | | 223,000<br>85.5% (h) | 223,000<br>85.5% (h) |
| Cooling tower circulating water pumps | | | | |
| North of station (d)—75 ft TDH | | 348,000<br>86% (h) | 2,000<br>0.5% (h) | |
| Southwest of station (d)—80 ft TDH | | | | 2,000<br>0.5% (h) |
| Cooling tower fans (e) | | 203,000<br>86% (h) | 1,000<br>0.5% (h) | 1,000<br>0.5% (h) |
| Cooling tower fog spray pumps (f) | | 13,000 | 13,000 | 13,000 |
| **Other Considerations** | | | | |
| Present worth of fixed charges for rate of depreciation excess for cooling towers over river intakes (g) (h) | | 314,000 | 343,000 | 343,000 |
| Lower average thermal efficiency | | | | |
| When operating on river intake | 6,000 | | | |
| When operating on cooling tower | | 220,000 | | |
| **Total Comparative Costs** | $1,472,000 | $3,329,000 | $3,977,000 | $3,513,000 |

**Footnotes:**

(a) 90,000 gpm × (8.33/33,000) × (.75/.85 efficiency) = 20 kw per ft of total dynamic head.

(b) 990 bhp × .75/.85 efficiency = 875 kw.

(c) Allowance due to possible river water temperature excess of 2 F over cooling tower discharge on hottest day at 200 kw per deg F and $100 per kw.

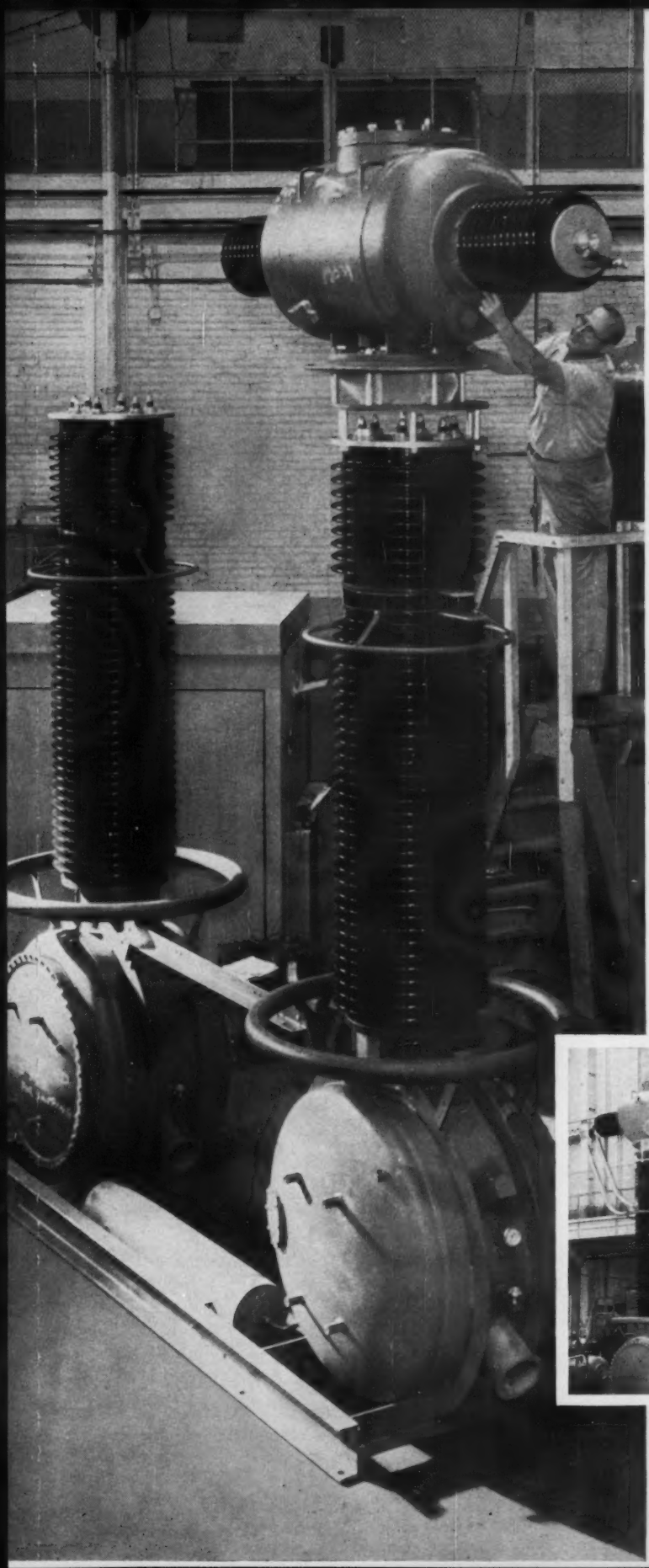
(d) 365 days × 24 hr × 20 kw × TDH × ($0.004/.13) × time factor.

(e) 365 days × 24 hr × 875 kw × ($0.004/.13) × time factor.

(f) 320 gpm × (8.33/33,000) × (.75/.85 efficiency) × 365 days × 24 hr × ($0.004/.13) × 50 ft head × (1 — time factor).

(g) Assumed 15 yr life of cooling tower and 40 yr life of river intake. (6.67% — 2.50%) × 15.046 present worth factor × estimated cost of tower.

(h) Time factor. Predicted equivalent uniform per cent of total time that auxiliaries are operated, on 6% present worth basis, on 40 yr life.



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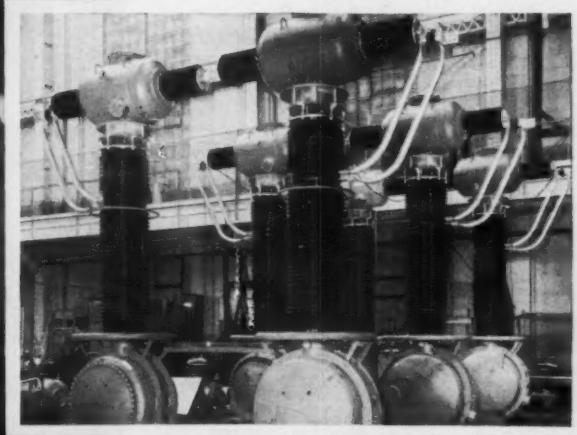


**GENERAL ELECTRIC'S EXPERIENCE** in building air-blast breakers is your assurance of superior performance. Breakers above, rated 230 kv, are being readied for shipment.

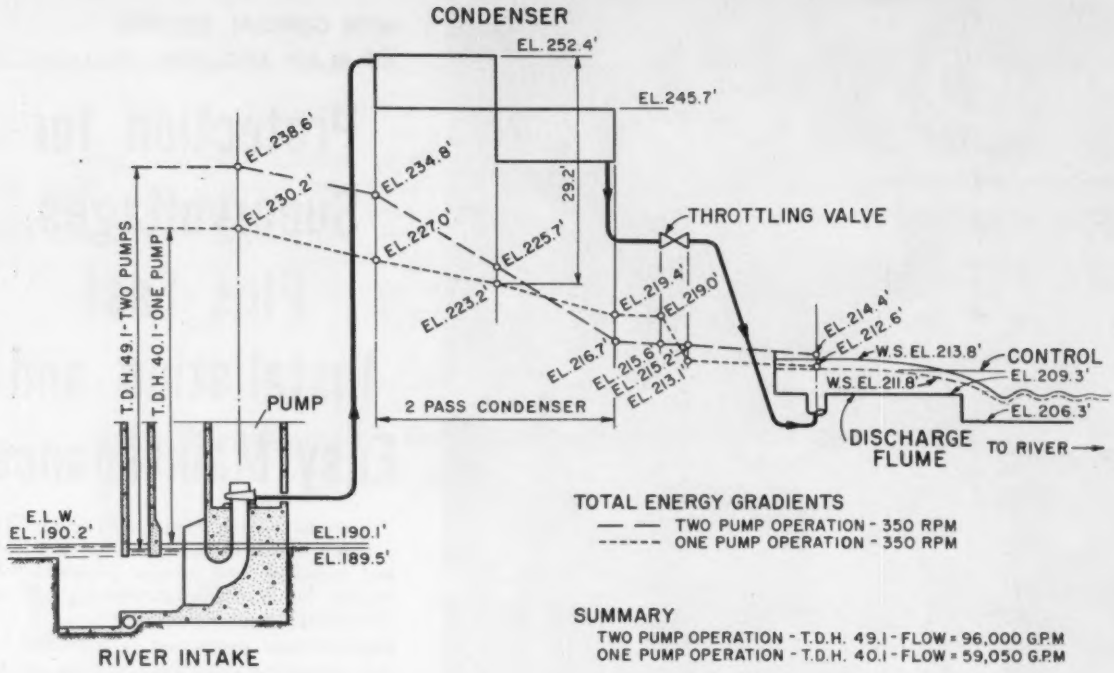



**FIG 3—FLOW DIAGRAM** for the cooling water system consisting of river intake discharging by open flume to the river is the result of design studies for the new plant. This is basic system in the Dickerson steam plant's evolution

the flume and discharges cooled water directly into the river slightly downstream from the intake. There the water can be drawn into the intake well to increase the cool water supply. Sulfuric acid and polyphosphate treatments and fog spray are required for maintenance. Treated lumber is required in the tower, which is removable if the dam is built and a pool formed.

Overall costs are increased greatly by installing and operating a cooling tower either alone or with river intakes. The closed-cycle tower north of the station would be the cheapest arrangement.

But if a cooling tower is installed merely to supplement the river intake, the open-cycle tower southwest of the station would be the least costly arrangement. If Unit 4 is installed without a cooling tower, estimated costs are applicable to later units, the effects of larger capacities being considered.

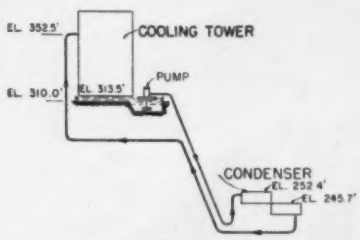



**FIG 4—COOLING WATER CLOSED CYCLE,** described in details of Scheme 2, would require only make-up water

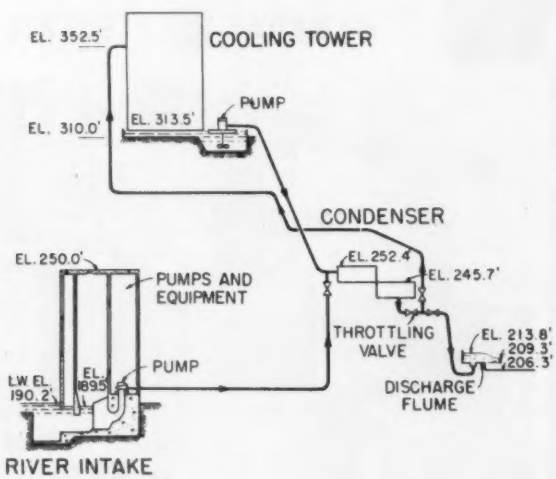



**FIG 5—RIVER INTAKE** with closed-cycle cooling tower is the arrangement described as Scheme 3 in the text

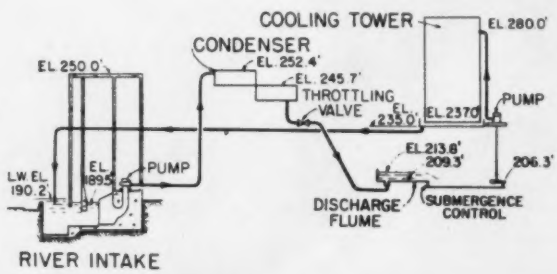
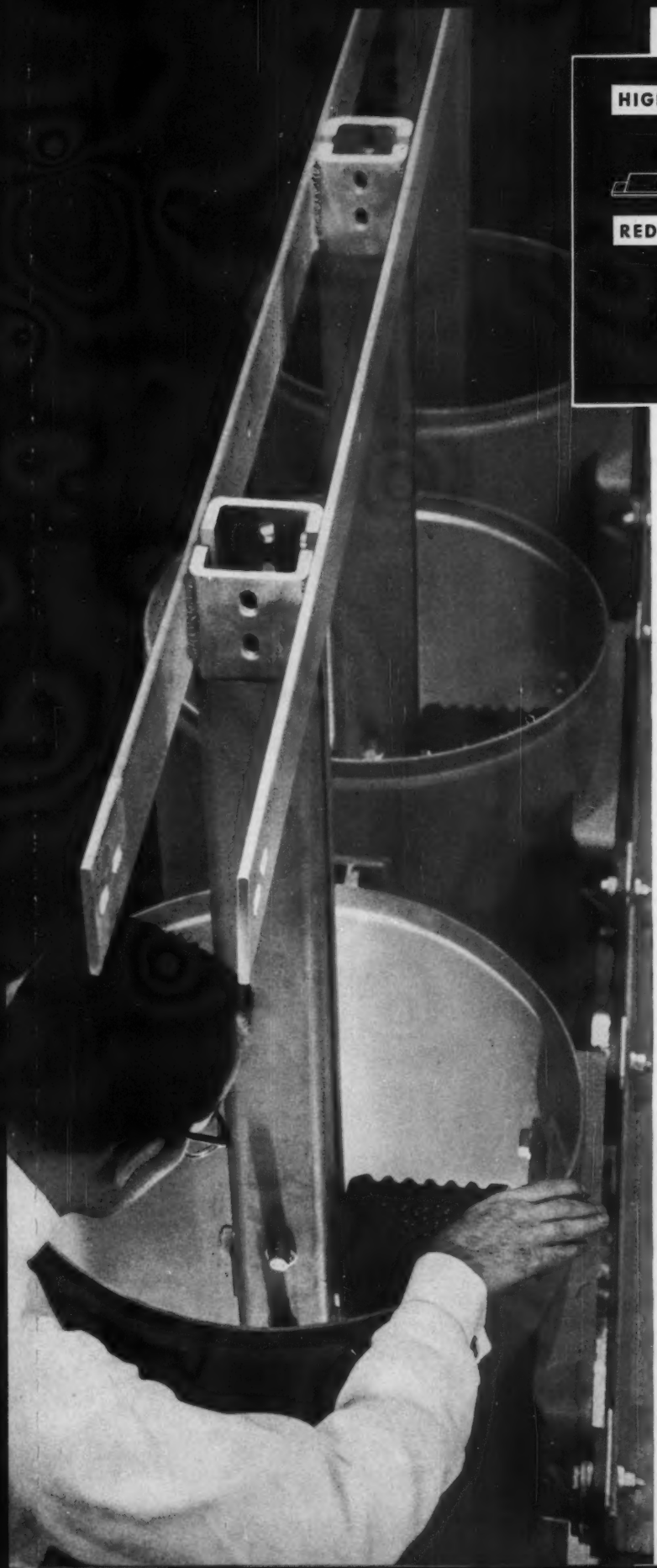
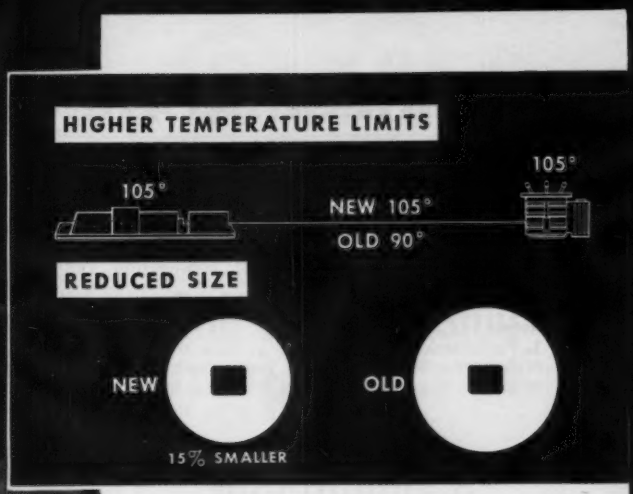



**FIG 6—OPEN-CYCLE COOLING TOWER** southwest of station is the arrangement described as Scheme 4 in the text



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# How to Join Bus Bars

**MORRIS BRENNER**, Vice President, Engineering, Penn-Union Electric Corp, Erie, Pa.

**Notes:**

**1.** Parenthetical numbers listed in Table II indicate the order of preference within the category. For example, when joining copper to copper bus, the first choice is silicon bronze hardware, the second is stainless steel, etc.

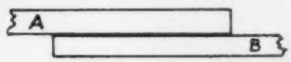
**2.** Where hard drawn bus is used, only large flat washers under the bolt head and under the nut are necessary, regardless of the material combination. Where soft drawn bus is used, even where there is no bimetallic connection, the use of a Belleville spring washer is suggested to help compensate for the creep of the bus under both mechanical and electrical load.

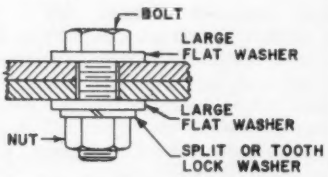
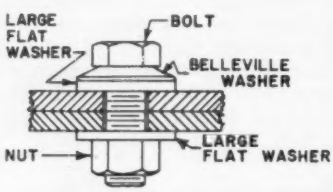
## Table I—Tightening Torques

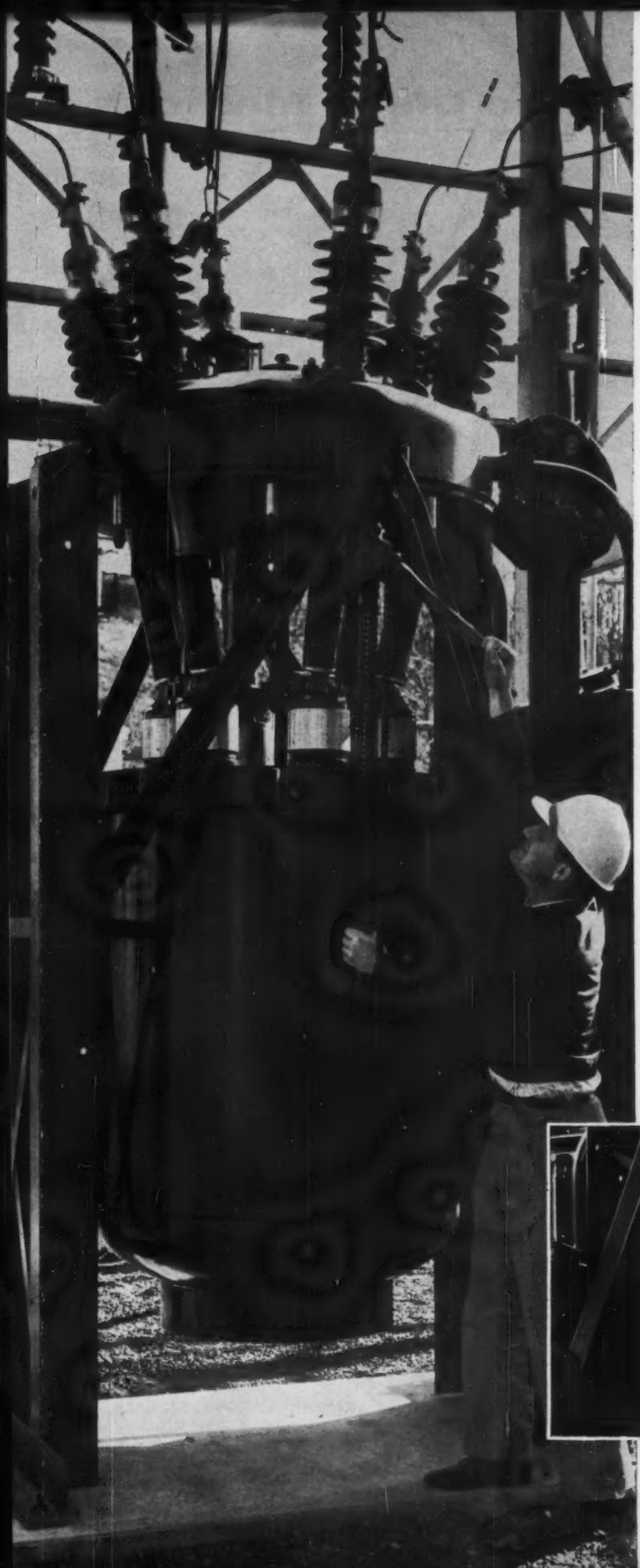
| Bolt Diameter | Nominal Torque Values | | | |
|---|---|---|---|---|
| | Silicon Bronze, Galvanized or Stainless Steel | | Aluminum Alloy (Lubricated) | |
| | Ft.—Lbs. | Inch—Lbs. | Ft.—Lbs. | Inch—Lbs. |
| 5/16—18 | 15 | 180 | — | — |
| 3/8—16 | 20 | 240 | 12 | 144 |
| 1/2—13 | 40 | 480 | 25 | 300 |
| 5/8—11 | 55 | 660 | 40 | 480 |
| 3/4—10 | 80 | 960 | 70 | 840 |

Shaded area per NEMA SGI-4.04—1958.

## Table II—Methods of Joining Bus Bars




| A | Cu. | Al. | Steel | Al. | Steel |
|---|---|---|---|---|---|
| B | Cu. | Cu. | Cu. | Al. | Al. |
| Hard Drawn Bus such as alloy aluminum   | (1) Silicon Bronze<br>(2) Stainless Steel<br>(3) Galvanized Steel | (1) Silicon Bronze<br>(2) Aluminum<br>(3) Stainless Steel<br>(4) Galvanized Steel | (1) Silicon Bronze<br>(2) Stainless Steel<br>(3) Galvanized Steel | (1) Aluminum<br>(2) Stainless Steel<br>(3) Galvanized Steel<br>(4) Silicon Bronze, Plated | (1) Aluminum<br>(2) Stainless Steel<br>(3) Galvanized Steel |
| Soft Drawn Bus such as EC-H13 Al.   | Same as above plus Belleville spring washer of proper rating for bolt size being used. Where corrosive conditions are expected the Belleville washer should be plated, made of stainless steel, or otherwise protected. | | | | |



*WITH GENERAL ELECTRIC'S ONE-TANK DESIGN, YOU GET . . .*

# 25% Reduction in Sub-transmission Breaker Maintenance

General Electric one-tank sub-transmission power breakers require up to 25% less maintenance time than conventional three-tank breakers. Here's why:

- **Five-cycle interruption** means shorter arc lengths, less carbonization and less contact wear. As a result, your inspection schedule can be spread out.
- **There's only one tank** to lower and raise, and this can be accomplished readily using a manual tank lifter. A pneumatic tank lifter attachment is available.
- **All six interrupters are easily accessible** when the tank is lowered. Loosening four bolts removes the interrupter to expose the contacts. No interrupter or bushing alignment is required. Linkage adjustments can be made externally at a crank box.

For more information on General Electric's maintenance-saving one-tank breakers for 15-kv through 46-kv service, call your G-E Sales Engineer. Or write to Section 494-02, General Electric Co., Schenectady 5, N. Y.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

**ALL SIX INTERRUPTERS** of G-E one-tank breaker are accessible when single tank is lowered. Contacts are exposed by loosening four bolts and removing interrupter.

# Test Demand Registers Accurately in Less Time

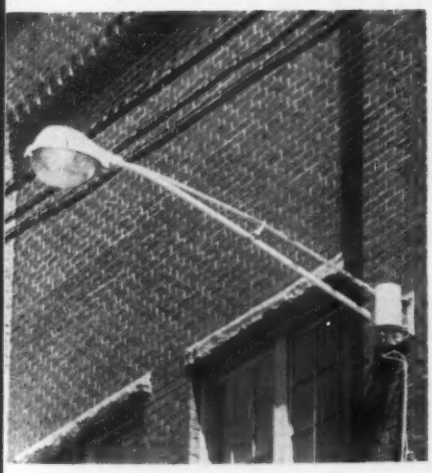
A 67% reduction in man-hours required for testing demand registers will be realized by Pacific Power & Light Co using a new gang tester developed by Meter Foreman Wayne Hunter. The new machine will also provide a thorough and more accurate check by simulating actual operating conditions. The mechanical testers formerly used required 1¼ man-years for the check of PP&L's 4,500 registers made every four years. The job now can be done in man-hours totaling less than six months.

The machine can be set up to test ten meters simultaneously for a half-hour period. The tester then is free for other duties until a kitchen timer recalls him to conclude the test and start another load.

Meters are mounted five on each side of a vertical frame with their worms gears meshed with worms cut into a central shaft. Accurate meshing is simplified by small magnifying glasses built into the frame and focused on the shaft worms. The vertical shaft is driven at constant speed by a synchronous motor mounted at the top of the assembly. Synchronization is checked constantly by a small strobe light.

Each side of the tester can be set separately to test at 120, 240, or 480-v so that five 480-v instruments can be checked on one side while five 240-v registers are checked on the other side.

# Wall Brackets Hold Lights Over Narrow Street



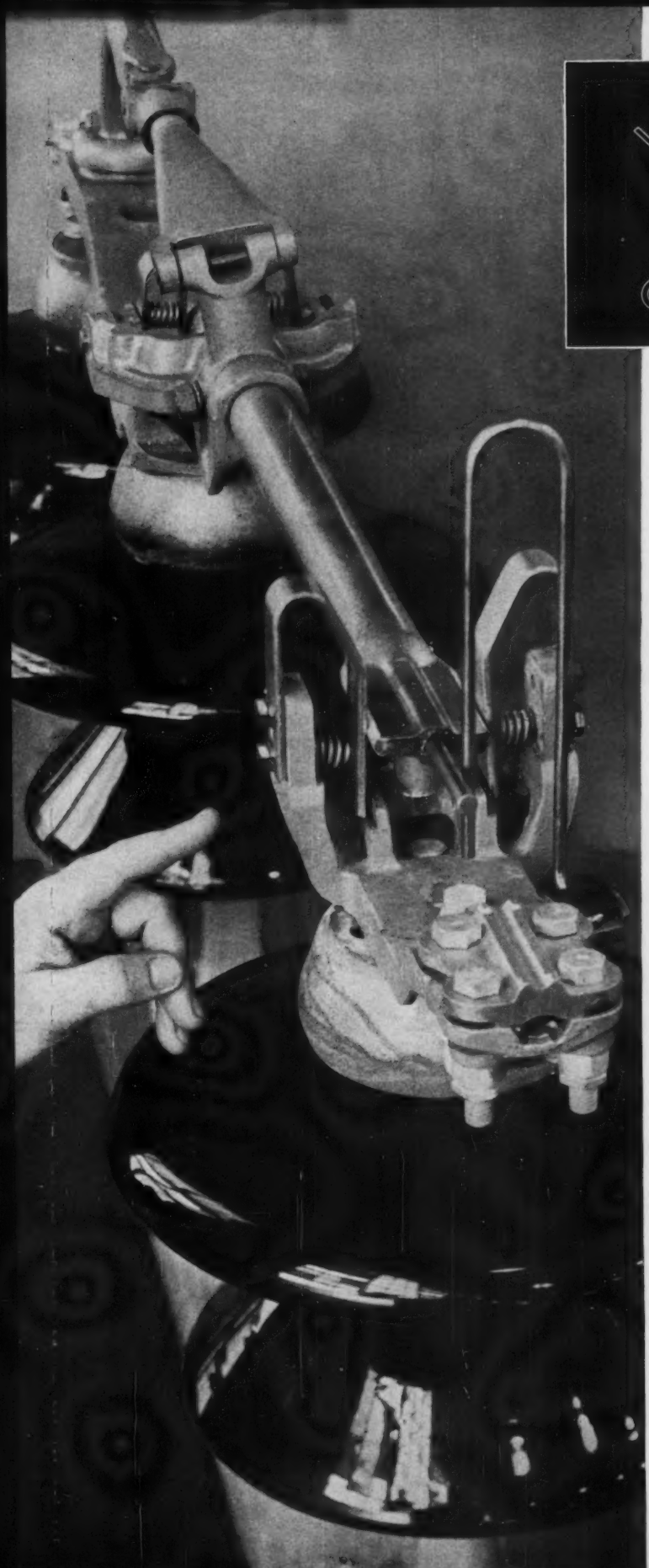
J. A. **BARNS**, District Engineer, Appalachian Power Co, Welch, W. Va.

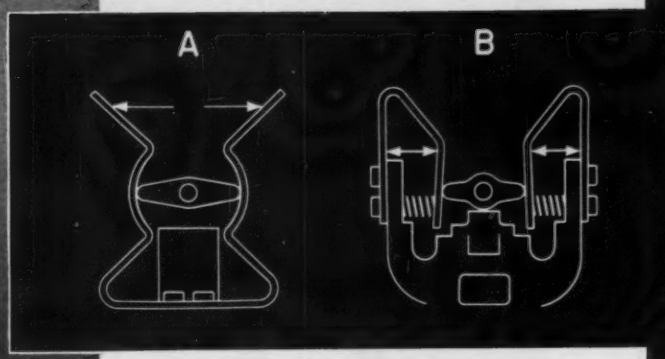
The mounting of 27 mercury vapor luminaries on building walls saved $6,500 for Appalachian Power Co on a street relighting job. The company was requested not to install standards on the extremely narrow street and sidewalks in the main business section.

The old system, consisting of a series system on messengers anchored to the buildings on either side of the street, interfered with proper ladder operation by the fire department. In agreeing to install a 240-v multiple mercury vapor system and mount it on building walls, the company needed suitable wall brackets.

Through the cooperation of Line Material Industries, McGraw-Edison Co, we designed a bracket for wall mounting that would support the luminaire and provide space for the ballast. Use of these 27 special brackets, costing an average of $11.60 each, resulted in the $6,500 saving, compared with regular steel standards.

(*More Methods on page* 90)






**ORDINARY OPEN CONTACTS (A)** are forced apart during short-circuit conditions. G-E inverted-loop contacts (B) actually increase their grip during short-circuit stresses to help assure continuous, reliable performance.

***GENERAL ELECTRIC RF-2 DISCONNECT SWITCHES PROVIDE . . .***

# Positive Operation During High Short-Circuit Stresses

Inverted-loop contacts with insulated stainless-steel back-up springs put the squeeze on the blade of a General Electric RF-2 disconnect switch. As a result, the blade stays firmly in contact even under high short-circuit stresses to help assure continuous, reliable service.

When the blade is closed, current flows up and around the stationary contacts, causing them to put added line contact pressure on the blade. This squeezing pressure actually increases during momentary flow. In short-circuit tests, the switch blade stayed in position without distortion or pitting of contacts.

Other features which contribute to the continuous, reliable performance of General Electric disconnect switches include:

- **Rotating Rear Insulator** which rotates the switch blade into and out of contact for ice-breaking action;
- **Arcing Horn** which diverts current away from contacts during opening and closing to help eliminate contact pitting and erosion.
- **Minimum Number of Current Transfer Points** to reduce heat losses, increase switch life, and reduce maintenance.

For more information, contact your General Electric Apparatus Sales Engineer. Or write to Section 495-07, General Electric Co., Schenectady 5, N. Y.

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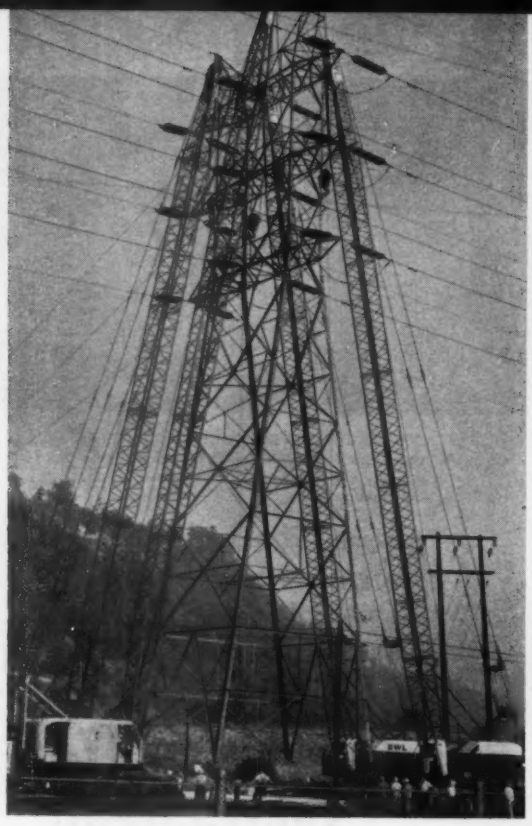


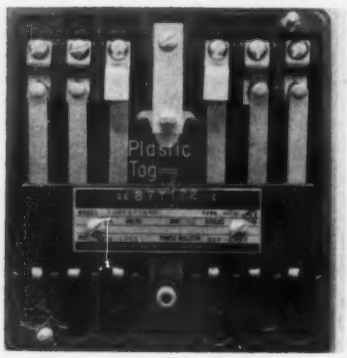
# Winches Add Side Pull For 135-Ft Tower

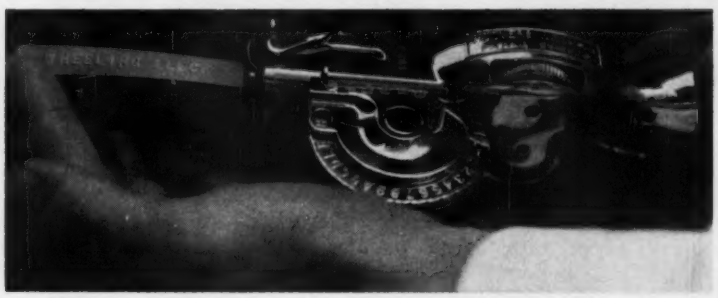
Side pull of transmission lines was offset by two winches while four 50-ton truck cranes raised a 135-ft dead-end angle tower in Los Angeles. Tensionometers were used so that tension applied by the winches could be adjusted to offset exactly the side pull of the power lines.

Department of Water & Power men raised the tower to provide clearance for a freeway which will span the river channel and pass beneath the power lines. Raising the towers would have been difficult under the most favorable conditions, but the task verged on the impossible because of the tremendous side pull of conductors to the 15-deg angle tower.

Tension compensating for the 11,700-lb side pull was applied by cables from two winch trucks on the far side of the river. One of the winches was a new 40,000-lb winch truck designed and built by the Dept's General Plant division shops.

After the tower had been lifted, prefabricated steel sections of the 10-ft extension were raised by two self-propelled cranes and bolted into place. Through close cooperation among the units involved, only 2½ hr were required to complete the job. This was about a third of the time which had been allowed.



# Plastic Makes Efficient Tag

**W. L. KELVINGTON,** Substation Engineer, Wheeling Electric Co, Wheeling, W. Va.

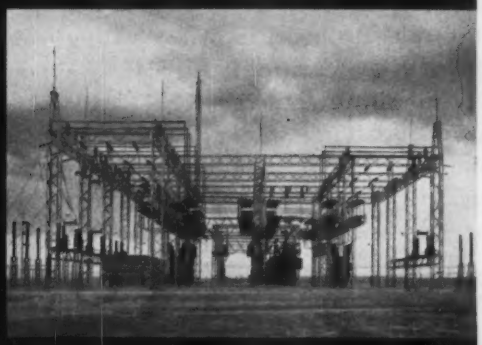
Colored plastic labels or tags made on the job with a portable hand embossing tool have these advantages: The tags do not conduct electricity; labor cost is considerably less; the plastic can be trimmed neatly and quickly; and color coding helps identify function or to distinguish between similar tagged items.

Use of plastic labels or tags has proved to be a simple and economical method of tagging trip relays, cables, conduit switches, switchboard wiring, meters, and other instruments. The plastic tape can be prepared on a Roovers Model 210 Midgie Hand Embosser or equivalent. These tools emboss 5/35-in. lettering on ½-in. wide plastic (or metal) tape.

Tags are permanently attached with adhesive or weatherproof cement. Adhesive-backed tapes can be used on smooth surfaces; pliobond, epoxy or casein cements are better for rough surfaces. Plastic tapes come in blue, green, red and brown. Material cost is about the same as for larger metal tags.

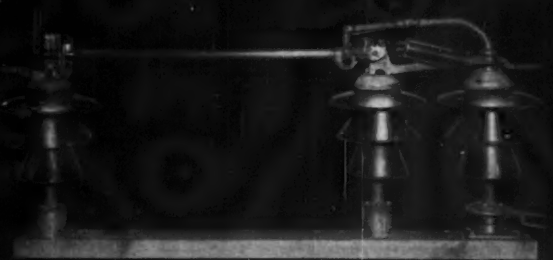
This method saves considerable time and cost compared with use of stamped lead-zinc tags or punched aluminum tape. Relays, for example, were formerly identified by securing tags to nameplates with the screws available. The large tags often obscured important nameplate data. Also, metal tags on cables could slip and short-circuit the terminals.

Single column of Type ATB air-blast power circuit breakers—115–460 kv.

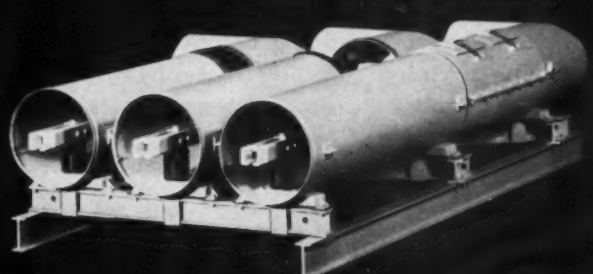


Completely designed and coordinated outdoor stations—7.5–230 kv.

Single-tank sub-transmission breakers—14.4–46 kv.



Disconnect switches—7.5–345 kv.



Isolated phase bus—14.4–34.5 kv, through 20,000 amps.

***GENERAL ELECTRIC OFFERS YOU A COMPLETE LINE OF HIGH-VOLTAGE SWITCHGEAR . . . . .***

# Why Settle for Less?

When you buy General Electric generation and transmission switchgear, you get one all-important benefit no other manufacturer can match—*outstanding added value.*

**You Get Top Product Design**—From giant 460-kv air-blast breakers to custom-tailored outdoor stations, General Electric high-voltage switchgear equipment is designed for easiest installation, top safety, optimum performance, and dollar-saving ease of maintenance.

**You Get Results of Research**—Important General Electric developments in the high-voltage switchgear field include:

- First single-tank, five-cycle outdoor sub-transmission breaker;
- First modern air-blast transmission breaker;
- First isolated-phase bus with conductors having a 105°C maximum hot-spot temperature.
- First computer-designed outdoor station.

**You Get Nation-wide Service**—G-E sales offices and service centers throughout the nation assure you of prompt, courteous application and installation assistance; also, fast, high-quality maintenance and repair service.

**Why Settle for Less?** Whether you want one disconnect switch, or a complete, custom-tailored switching station, with General Electric you get the *best* in switchgear. For information on specific equipments, contact your G-E sales engineer. Or send in the coupon below.

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

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**General Electric Co.**
**Section A492-13**
**Schenectady 5, N. Y.**

*Send me detailed information on the following:*

- ☐ High-voltage air-blast breakers
- ☐ Disconnect switches
- ☐ One-tank sub-transmission breakers
- ☐ Isolated phase bus
- ☐ Outdoor stations 7.5 to 345 kv

OTHER: _____

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

# Procurement & Products

**OUTLOOK** ▶ **Public utilities plan to boost capital spending 9%** over their 1959 level, according to a Securities & Exchange Commission-Commerce Dept report. All utilities, electric, gas, water, and transportation, intend to spend $6.1 billion for capital expansion and improvement this year, compared with $5.7 billion last year. Projections indicate the spending will rise from an annual rate of $5.7 billion in the current quarter to $6.22 billion in the last two quarters of the year.

**WAGES** ▶ **Preliminary groundwork is being prepared for labor negotiations** at General Electric and Westinghouse, with the present contracts expiring in October. President James B. Carey of the International Union of Electrical & Radio & Machine Workers has strengthened his hand by gaining amendments to the Union's by-laws. The amendments would enable him to obtain a strike vote with a bare majority of the workers—rather than the two-thirds vote formerly required —and also give him more authority over local union officers.

**STEEL** ▶ **In what could be a hint of steel price boosts,** the official summary of U. S. Steel Corp's annual report dealt at length with the inflationary pressures of wage increases. The report noted that the full cost of the steelworker's hour of work is 65% greater than the so-called basic wage rate the steelworker receives. "Wage inflation initiated anywhere tends to ripple out horizontally across the land," continues the report. "It then requires defensive cost-covering price increases that elevate all the costs of doing business and even those of carrying the activities of the government."

**ALUMINUM** ▶ **Aluminum fabricators continue pressure to lower aluminum pig prices.** The Extruders Council would like to beat down the 26¢ a lb cost to the levels at which U.S. producers are selling abroad—around 22¼%. But the big producers reply that the present price does not in any part compensate for the recent wage and material increases that they are bearing.

**COPPER** ▶ **Copper prices are retreating toward a 33¢ a lb price** delivered from all sellers, including merchants. Some trade sources see a surplus of the metal by mid-year.

**CONGRESS** ▶ **Bill which would prohibit "below cost" sales** at the manufacturing, distributing, or retailing level is pending before the House Commerce Committee. The new piece of proposed legislation would hit sales in which the effect, without a showing of intent, would be to restrict "unduly" a competitor's business.


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New Equipment ..... page 104
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NEW CHANCE ALL ALUMINUM TAP CLAMPS FOR HEAVY DUTY ALUMINUM-TO-ALUMINUM TAPS IN HIGHLY CORROSIVE AREAS

CHANCE "P. C." CC TAP CLAMPS FOR COPPER-TO-COPPER TAPS

CHANCE "P. C." AGP TAP CLAMPS FOR BI-METAL CONNECTIONS OR "P. C." AA FOR ALUMINUM-TO-ALUMINUM

# THREE WAYS TO MAKE A GOOD HOT LINE TAP

The first step to making a good line connection is selecting the right and the best clamp for the type connection to be made—there's nothing profound about that—but there's something profound about the development of the product to meet the requirement. Chance engineers "dig much deeper"—go much further than you would probably think necessary to develop hot line clamps for various types of connections. Here are three examples of the best from their concentrated development work:

*FOR ALUMINUM-TO-ALUMINUM HEAVY DUTY IN HIGH CORROSION AREAS.* The new Chance All-Aluminum Heavy Duty Clamp is designed for use with the big conductors employed in today's farsighted construction projects. Except for one stainless steel pin, this husky clamp is made entirely of aluminum—ideal for aluminum-to-aluminum taps in areas where atmospheric contamination creates a problem with other clamps. Its complete compatibility with aluminum conductor prevents galvanic corrosion and also results in uniform thermal coefficients of expansion for maximum operating efficiency. A special "waved" main line contact gives good low resistance connections even on slightly oxidized conductors. The clamp handles conductors up to 397.5 MCM ACSR in both the main line and jumper terminals.

*FOR COPPER-TO-COPPER,* the Chance Bronze-Bodied S1520 "P.C." Hot Line Clamp is the newest development. This small clamp has a wide range from 1/0 std. to 8 solid copper main line or jumper. It is similar in design to all other Chance "P.C." clamps in that the clamp jaws hang on to the conductor without turning as the clamp is tightened and jaws are wide enough to make contact with all the outside conductor strands. And, like the larger clamps in this series, this clamp has excellent current-carrying capacity; low contact resistance. It will carry the maximum current allowed for the largest jumper wire without overheating any part of the clamp.

This new compact clamp is especially desirable for use with bail clamps to connect apparatus or equipment.

Kindred Chance bronze clamps are available for conductor sizes to 1500 MCM Stranded copper main line 300 MCM str. cu. jumper.

*FOR BI-METAL - EITHER WAY*—use Chance AGP Hot Line Clamps. These clamps are coated with high density, fortified cadmium that permits aluminum-to-copper, aluminum-to-aluminum, or copper-to-aluminum taps. The thick cadmium coating wards off corrosion and electrolysis in the connection. Thermal expansion of the clamp is compatible with aluminum conductors keeping contacts tight. And, since the thermal coefficient of copper is less than aluminum, copper conductors are not deformed even under extreme temperature variations. AGP Clamps in four sizes cover a range from No. 8 solid copper to 1500 MCM stranded and comparable aluminum sizes.

Some advantages, important to you, that all these Chance Hot Line Clamps have in common are the careful selection of alloys; the fine-grained heat-treated castings automatically controlled and continuously inspected in the manufacturing process; protected eye-screw threads that run in a chamber of all-weather corrosion-inhibiting lubricant; wide jaws for maximum contact, high conductivity; ample body for heat dissipation and resistance to heavy surges; strength to endure without mechanical failure and balance to keep down vibration fatigue and lengthen conductor life.

Another all-important step in making good Hot Line Taps is taken care of automatically when you buy Chance packaged clamps because z.i.n. 100 contact aid is factory-applied to the contact area. Printed on the sealing tape of each package is a reminder to clean and coat the conductor—when linemen heed this advice a good connection is virtually certain.

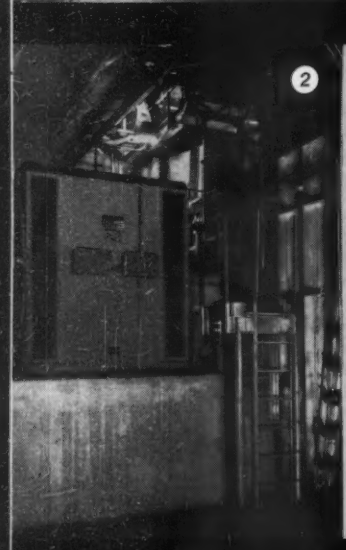
ABC INDUSTRIES

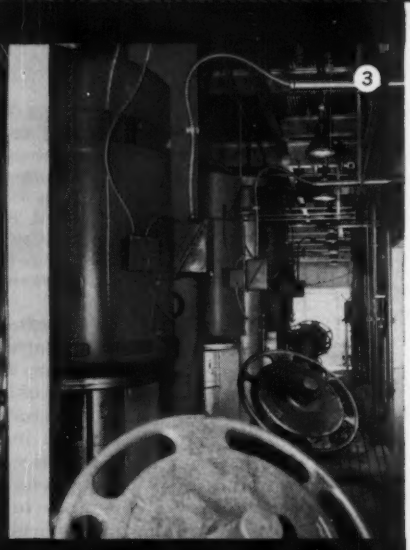
**A. B. CHANCE CO.**

CENTRALIA, MISSOURI

(A. B. Chance Company of Canada, Ltd., Toronto)

CC60-5





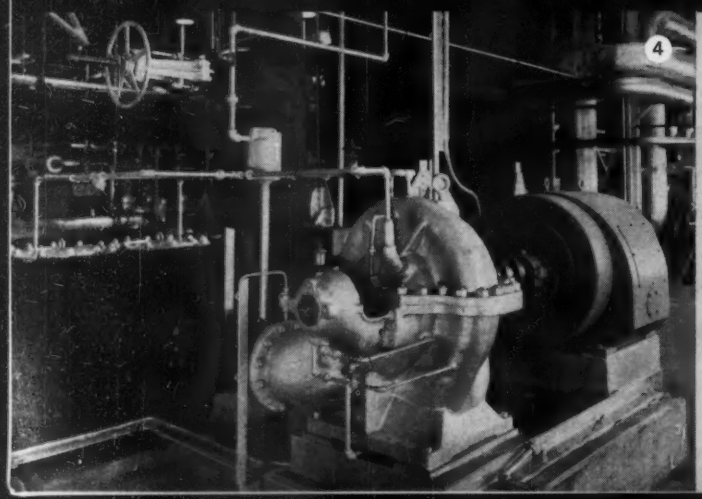
1. Twin 600-hp, 225-rpm vertical Elliott motors drive condenser circulating water pumps rated 84,000 gpm each at 25-ft total dynamic head. Pumps are located in screen house on Lake Erie shore.

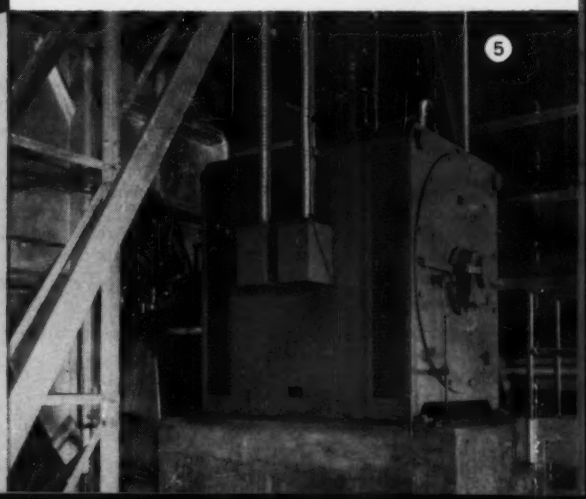
2. (Far Left) One of the two 1750-1250-hp, 890/710-rpm Elliott induction motors that power the two forced-draft fans, each with capacity to move 370,000 cfm of air.

3. (Near Left) Four vertical single-stage water-cooled boiler circulating pumps deliver water at 6480 gpm driven by 300-hp, 1800-rpm vertical Elliott motors. Water is pumped to four drums, mounted on furnaces.

4. (Lower left) Elliott twin strainer and 300-hp motor serve this sluice water pump in supplying water to ash hopper for quenching red-hot ash.

5. (Below) One of two 456,000-cfm induced-draft fans driven by 2250/1750-hp, 705/585-rpm Elliott induction motors.



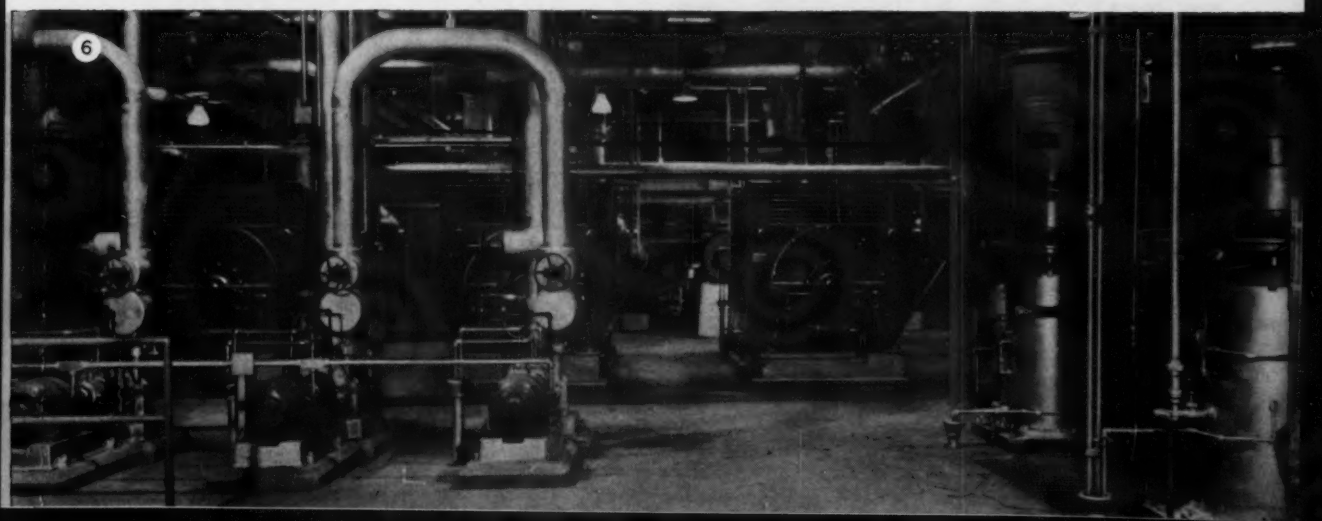


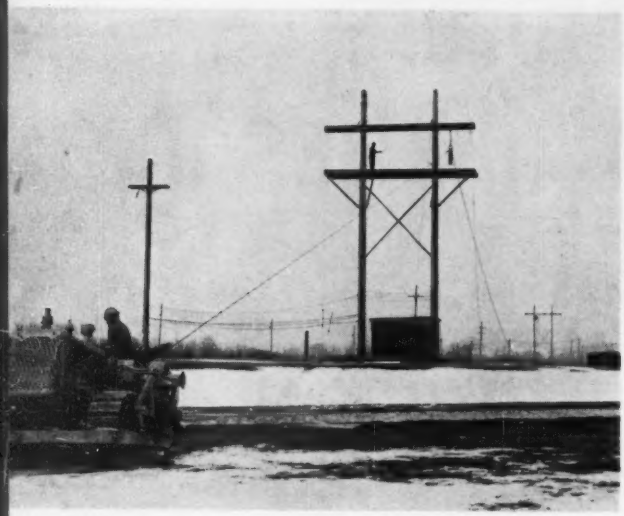
# Elliott Motors drive auxiliaries in huge CEI Ashtabula Plant Extension

The addition of Unit No. 5 doubles the capacity of Cleveland Electric Illuminating Company's Ashtabula Power Plant. Here twenty-seven Elliott motors in sizes from 25 hp to 4000 hp drive all major auxiliaries. With few exceptions, all motors are squirrel-cage induction type with open dripproof enclosures and Class "A" insulation. Motors of 250 hp and above are three-phase, 4000-volt class and are equipped with thermocouples for automatic temperature scanners. Each motor has been carefully coordinated with its driven equipment to assure maximum reliability and overall economy.

6. In the photograph below are shown four sizes of Elliott motors which provide pumping and pulverizing power in CEI's Ashtabula Unit 5. At right, pair of 450-hp, 1200-rpm vertical motors power the condensate pumps. Trio of 4000-hp, 3600-rpm induction motors power boiler-feed pumps, background. Just visible, extreme center background, is one of eight motors driving coal pulverizer mills. Left foreground shows three of four Elliott units powering high-pressure heater drain pumps.

**ELLIOTT**
*Company*
Jeannette, Pennsylvania
GO-1





**TRACTOR HANDLED PULLING** operation (above) as Kaiser Aluminum & Chemical Corp ran installation of conductors

**NORMAL STRINGING PRACTICES** were augmented by some special procedures in field stringing operations at Penelec

# Conductors Tested for Penelec's 460-Kv Line

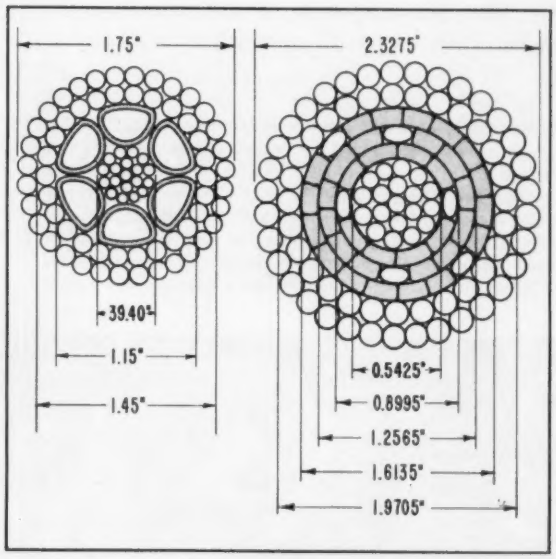
Two new types of conductors were checked for use on Pennsylvania Electric Co's 460-kv line in a field-stringing operation conducted recently at the utility's Newark plant site by the manufacturer, Kaiser Aluminum & Chemical Corp. One model was an expanded version of a design which Kaiser had produced in smaller sizes previously; the other was a completely new design.

The expanded type is made up of a stranded steel core, of 0.5425-in.-dia; a combination of twisted paper and aluminum strands which builds up the diameter to 1.6135 in., and an outer portion of two layers of aluminum strands which brings the outside diameter to 2.3275 in. This, says Kaiser, is larger than any wire of this kind which has been made. It will be installed as single conductor per phase.

The overall diameter of the new type of tubular expanded conductor is 1.75 in. The core, of stranded steel, has a 0.394-in.-dia. Six aluminum tubes around the core expand the diameter to 1.15 in.; the outer portion of aluminum strands brings the diameter to 1.75 in. This conductor will be bundled when it is installed on the Penelec test line.

In addition to adhering to standard stringing practices, Kaiser Aluminum personnel took special steps to determine how well the conductors would stand up under abuse. Results were satisfactory; after especially sharp bending, the strands went back into position when tension was again applied and overall performance of both conductors checked out well. After the tests were completed, the conductors were lowered and inspected by key personnel of Pennsylvania Electric and Kaiser.

The prototype 460-kv transmission line will be the first 3-phase, 460-kv line in the U.S. to operate at full voltage and serve as part of an established transmission grid. It is scheduled for energization this summer.




**TUBULAR EXPANDED CONDUCTOR** (above, left) is a new design built up by aluminum tubes and strands. The 2.3275-in.-dia is expanded version of former design

(*More News of Manufacturers, p* 98)

# KNOW-HOW

Victor 900 Suspension Insulators (EEI-NEMA, TDJ52-3) are universally used by utility men because they're rugged and built to last.

Looking at a VICTOR Suspension insulator, you'd think it was an easy item to manufacture. It isn't. You don't just stamp them out like cookies, bake them in an oven and presto—insulators. No, a lot of research, engineering and manufacturing know-how over a long period of years is required to produce insulators that have uniform performance characteristics and far exceed EEI-NEMA standards.

VICTOR has an enviable reputation for knowing how to make insulators that are superior in performance under the most gruelling conditions of service. Many a power man has decided to play safe . . . and choose VICTOR. For catalog, specifications and prices, contact your nearby Victor sales office. Victor Insulators Division, I-T-E Circuit Breaker Company, Victor, N. Y.

I-T-E CIRCUIT BREAKER COMPANY

# LET'S TALK ABOUT STRAND...

# *Aluminized* STRAND

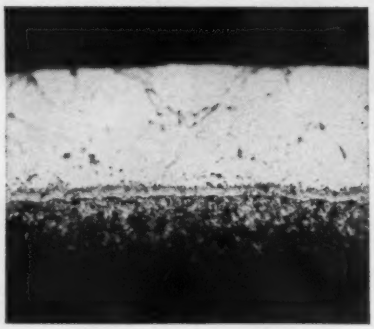
ACCO *Aluminized* steel strand is composed of steel wires which have an adherent, ductile aluminum coating applied by the hot dip method. The result—strand with all the strength of steel, and with the corrosion-resistance of aluminum. Also, you get these important advantages:

**Aluminum oxide protection**—Aluminum, when exposed to the atmosphere, has a film of aluminum oxide formed over it. This film, though thin, is impervious to corrosive atmospheres, provides extra protection in the most severe service.

**Electrochemical protection**—Should nicks or cuts pierce the aluminum coating, the corrosion-resistance will be retained by an electrochemical "healing" process.

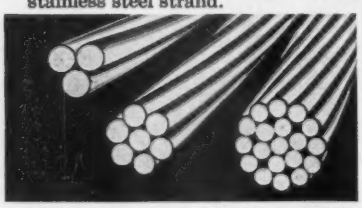
Salt spray tests, conducted according to ASTM procedures, show that with equal thicknesses of coating, *aluminized outlasts galvanized by more than 2 to 1.* Available for guy wire, ground wire and messenger wire applications, Page ACCO Aluminized steel strand is offered in Common, Siemens-Martin, High Strength, Extra High Strength and Utility grades with physical properties conforming to ASTM Spec. A-122-54T and A-363-58.

Page also makes galvanized and stainless steel strand.



500X magnification above shows thin aluminum-iron alloy resulting from diffusion of the two metals, and the outer layer of aluminum in the form of a fine-grain cast structure.

5-year test exposure to industrial atmospheres covered strand with coating of sulfide, oxide and soot. Scrubbing with soap and water showed aluminum coating completely unaffected.



Page ACCO Aluminized steel strand is available with 3, 7 and 19-wire construction.

**WRITE FOR DETAILS.** Booklet DH-537 explains manufacture, properties and uses of Page ACCO Aluminized Steel Strand. Write us at Monessen, Pa., for your copy.

## PAGE MANUFACTURERS WIRE

ACCO

Page Steel and Wire Division
American Chain & Cable Company, Inc.
Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore. San Francisco, Bridgeport, Conn.

## OTHER ACCO ALUMINIZED STEEL WIRES

Aluminized ACSR core wire now available from leading manufacturers of aluminized conductor cable.

Page Chain Link Fence of ACCO Aluminized wire provides economical, longer-lasting protection.

**Tie wire, telephone and telegraph wire, lashing wire, barbed wire, and other products are also available in Page ACCO Aluminized wire. Ask us for details.**

**PAGE** *-the source for answers to wire problems*

## Gas Turbine Installed For Peaking Service

The 5,500-kw peaking-service gas turbine (above) is being built by Westinghouse Electric Corp for the city of Austin, Minn., to permit deferment of investment in additional steam-generating facilities.

A 22-Mw turbine-generator will be added to the system in a few years. In the meantime, a 80,000-lb-per-hr steam generator will be replaced by a new 200,000-lb-per-hr unit. The gas turbine will be used for emergency and peaking service during the change-over; later, when the steam plant has been expanded, it will be part of a combined cycle to increase thermal efficiency by about 5%. Westinghouse will install the unit in the basement of the municipality's present power plant.

## NEMA Forms New Division

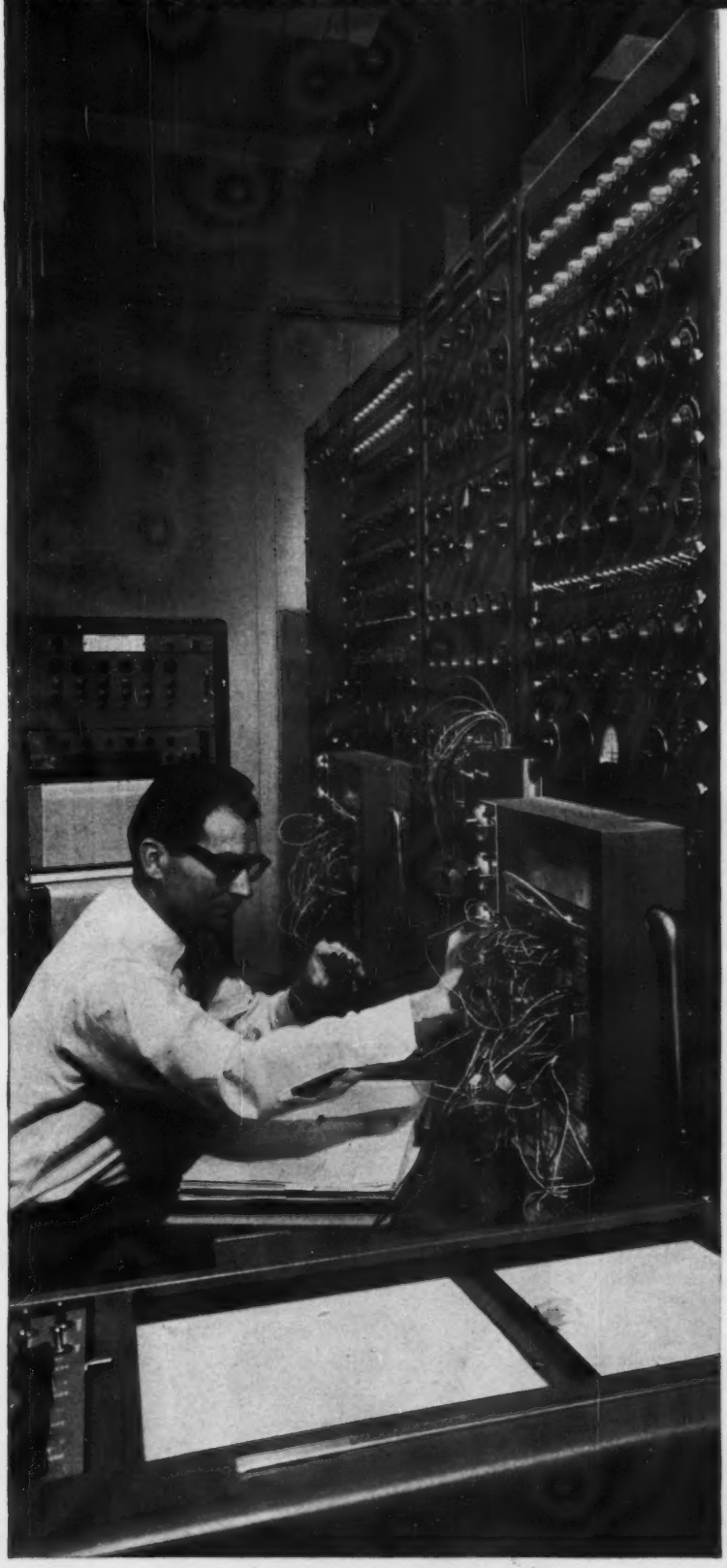
Manufacturers of generation, transmission, and distribution equipment have joined in forming their own division within the framework of National Electrical Manufacturers Assn. It is the third division which has been set up under NEMA's new reorganization plan.

This Generation, Transmission, and Distribution Division is made up of the following product sections: Capacitor, Hydraulic Turbine, Lightning Protective Devices, Pole and Transmission Line Construction Materials, Switchgear, Steam & Gas Turbine, Transformer, Specialty Transformer, High Voltage Insulator, and Electrical Measuring Equipment.

The division's chairman is C. H.

(*Continued on page* 101)

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



*COMPUTER STUDIES BY GENERAL ELECTRIC PROVE . . .*

# Reduced Regulator Bandwidths Increase System Earnings

General Electric voltage regulators provide three added benefits to distribution systems through bandwidth reduction . . . extra feeder length, capacity, and revenue! New General Electric computer studies now prove that *reduced regulator bandwidths are practical* and that they result in increased distribution system performance with *no sacrifice of regulator life.*

Electric utilities have long recognized the desirability of bandwidths as low as ±¾ volts. The assumed stumbling block was the number of regulator operations. Through analysis of actual (as opposed to theoretical) data, new General Electric computer studies indicate that bandwidths of ±¾ volts are feasible from any standpoint, including that of equipment life.

Your General Electric regulator representative can show you the specific effects on regulator operation as bandwidths are reduced. He will show you how to determine if operations must be controlled . . . and if so, how to control them. Increase the return on your regulator investment, possibly with your existing equipment.

Take full advantage of the important benefits of General Electric ML-32 step regulators. Reduced bandwidths provide more *usable* kva on the line . . . permit increased loading of existing feeders. This easily attainable "power adder" can mean increased line length and capacity—important tools to reduce or defer investment. Reduced bandwidth settings make significant contributions to feeder revenue, too!

And contact your General Electric sales engineer for even more reasons why General Electric regulators cost less on the line! General Electric Company, Schenectady 5, N. Y. 456-02

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

# Delta-Star Puts 10,000-Amp Bus to Water-Cooling Test

A 10,000-amp, isolated-phase generator bus (above) underwent a water-cooling test in Delta-Star Electric Division's Chicago laboratory recently. The 19-in.-dia circular aluminum bus is enclosed in a 40-in. aluminum duct.

With the forced cooling, 15,000 amp were kept flowing through the bus while bus temperature rise was held within allowable limits. Ordinary tap water was re-circulated through the bus at different temperatures and rates of flow while bus temperature rise was constantly checked. The circulating water was cooled in a refrigerating unit.

It was possible to use tap water for the test because the voltage was low. With much higher normal operating voltages, distilled water or oil would have to be used.

Conclusions of the test were: Space saving is the main contribution a liquid-cooled bus offers. When limited space is the prime consideration, forced cooling may be imperative. However, installation and maintenance of supplementary equipment such as pump, heat interchanger, and pipes are required and constant watchfulness is necessary. Additional power loss above that in self-cooled buses is expected.


## HOW YOU MAY CUT YOUR MACHINE FAILURES BY AS MUCH AS 25%

**by J. R. RATCHFORD, Specialist, Lightning Arresters and Cutout Marketing**

Experience shows that 25% of failures of unprotected rotating machinery are due to lightning.

**With percentages** like that against you, lightning and surge protection is imperative. The cost of this protection is a small fraction of the a-c motor or generator investment, and can be as low as 1/100th the cost of only one large a-c machinery repair. General Electric lightning protective equipment is available for all ratings of a-c machine operating voltages.

**The Pyranol* protective capacitors** in the G-E system provide turn-to-turn insulation protection by reducing the steepness of applied lightning surges and reflections within multi-turn machine windings. The Thyrite* Magne-valve station-class arresters protect the major (line to ground) insulation by limiting the magnitude of incident and reflected surges on the windings. Used in parallel, this combination effectively combats lightning-caused machine downtime and resulting repair costs.

May we show you specifically how you can protect your a-c rotating machinery? Contact your General Electric representative for full details or write to Sect. 435-24, General Electric Co., Schenectady 5, N. Y.

* Registered Trademark of the General Electric Company.

GENERAL ELECTRIC

General Electric Capacitor-

## NEMA Forms New Division

(*Continued from page* 98)

Bartlett, deputy manager of Westinghouse Electric's East Pittsburgh division and a member of NEMA's Board of Governors. Other members of the division's board are: M. E. Scoville, manager—engineering, General Electric's capacitor department; H. Sinclair Kerr, president, Star Porcelain; J. J. Doyle, vice president, Murray Mfg; Brent Mills, executive vice president, Lapp Insulator; Andrew Liston, vice president — sales, Baldwin-Lima-Hamilton; L. J. Ott, vice president and general sales manager, Ohio Brass; Millard W. Wertman, vice president and general manager, Utilities Service; L. C. Marschall, executive vice president, Sola Electric; George N. Lilygren, president, Elliott Co; L. W. Long, assistant general manager, Allis-Chalmers' power equipment division; and R. N. McCollum, manager, Westinghouse's power transformer department, transformer division.

## Year-End Earnings Reported

Foster-Wheeler Corp's 1959 earnings more than doubled the previous year's, reaching $5,907,016, equal to $9.92 a share. This was realized on less billings, which dropped to $163,653,410 from $178,947,305 in 1958.

Joslyn Mfg & Supply's earnings for 1959 rose from $3,202,922 in 1958 to $4,630,707, equal to $7.43 a common share.

Sangamo Electric Co's net income increased from $1,668,000 in 1958 to $3,027,000 in 1959, equal to $3.75 a common share. Two-for-one split is recommended by the company's board of directors.

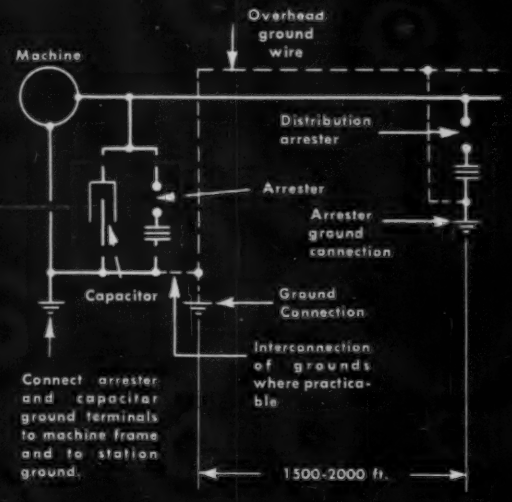
## *MANUFACTURERS BRIEFS*

**Riley Stoker Corp** will make steam generating equipment in France, Spain, Portugal and in possessions of these countries, under an agreement recently reached with Societe d'Exploitation d'Usines Metallurgiques of Corbehem (Pas-de-Calais) . . . **Line & Cable Accessories, Ltd,** purchases plant in Newmarket, Ont., where two Toronto plant operations will be combined. Company makes and distributes pole line hardware, transmission line materials, and power connectors . . . **American Chain & Cable** buys Electro-Mech Corp, of Norwood, N. J., makers of control systems, to operate it as a subsidiary . . . **Nuclear Congress** and International Atomic Exposition will be held April 4 through 7 at the New York Coliseum . . . **English Electric** will move its Canadian operations early next year from St. Catherines to Scarborough, near Toronto, where John Inglis Co, EE's Canadian affiliate, is consolidating all its operations and building a new $2-million plant . . . **An Austrian engineering firm** has been awarded an order to blueprint "world's biggest railroad car," to weigh about 200 metric tons. It will be able to carry complete transformers weighing up to 300 metric tons. The car will be 282.08 ft long, with 30 axles.


# Arrester Combination Gives You Low-Cost Lightning and Surge Protection for Your High Investment in A-C Rotating Machines

Thyrite Magne-valve station-class arrester

Pyranol filled capacitor




Typical scheme of protection for machines connected directly to exposed overhead lines

GENERAL ELECTRIC

## MOLONEY DISTRIBUTION TRANSFORMERS ARE DESIGNED TO MEET ALL SYSTEM REQUIREMENTS

Comparative analysis of distribution transformers invariably leads to one conclusion . . . the best distribution transformer has all characteristics of design carefully developed in respect to their contribution to system efficiency, dependability and economy.

In Moloney Distribution Transformers, no one feature, electrical or mechanical, is radically improved at the expense of another. Instead, each part of the design is carefully considered and balanced with the others, to provide a distribution transformer that will give the best all-around system performance.

Utility systems benefit from this philosophy of design because every Moloney Distribution Transformer feature is designed to perform in the best possible manner compatible with every other aspect of the design, and thus provide "More Power To You."

Desirable Characteristics of Moloney Distribution Transformers Include . . .

Low Core Loss
Low Exciting Current
High Overload Capacity
Impulse Strength
Low Impedance
High Efficiency

**Here Is How They Are Achieved.**

# SUPERIOR PERFORMANCE BECAUSE...

**MOLONEY ELECTRIC CO.**

*Since 1896 . . .* ***MORE POWER TO YOU***

## 1 Design

Computers review hundreds of possible designs in a relatively short time, to obtain design parameters which promise to develop into the best all-around distribution transformer design. Design engineers review the computer data. Then guided by Moloney's extensive experience in transformer design and also by utility requirements, they prepare the final design.

## 2 Low Core Loss and Exciting Current

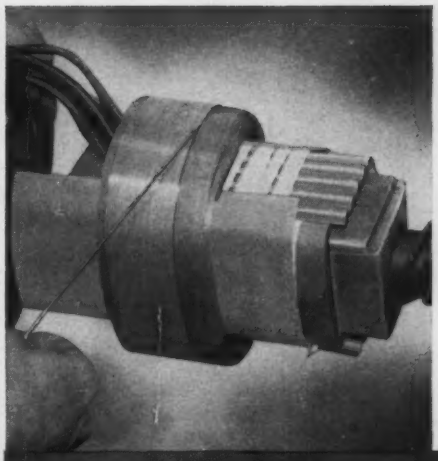
Skillful application of high grade cold rolled grain-oriented silicon steel, carefully handled and annealed, gives low core loss and exciting current. The core design uses one turn laminations with the ends butted one against the other. To minimize the required exciting current, the butt joints are staggered, providing a high permeability path for the flux.

## 3 High Overload Capability

Corrugated pressboard, strategically placed, forms cooling ducts which expose a larger area of the winding surface to the oil, thereby reducing the winding gradient. The result is a lower hottest spot temperature under all conditions of load. Therefore, under conditions of overload, any loss of transformer insulation life is minimized.

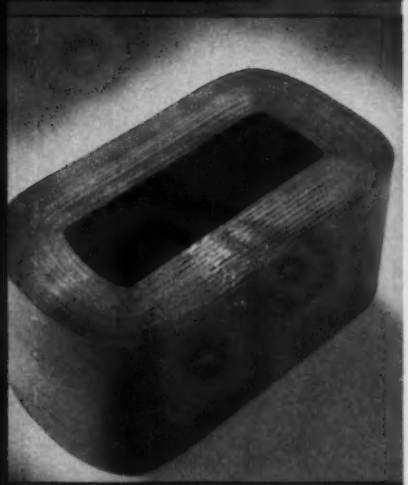
ME60-3

**SALES OFFICES IN ALL**



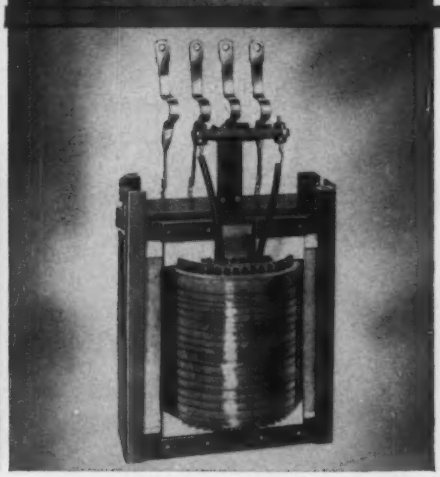
## 4 High Impulse Strength

At the line ends of the high voltage coil, extra insulation is provided between layers of the winding, and cording is placed between adjacent turns. At higher voltage ratings the high voltage winding is sectionalized to reduce the voltage between adjacent ends of succeeding layers. This practice reduces the turn-to-turn and layer-to-layer stresses and, consequently, gives the coil high impulse strength.



## 5 Low Impedance, Improved Voltage Regulation

The low-high-low sequence coil design used in Moloney Distribution Transformers is one of the contributing factors to low impedance. Because of this low impedance, Moloney Distribution Transformers have a lower internal voltage drop under all conditions of load. The result is improved voltage regulation which means customer satisfaction and increased revenue.

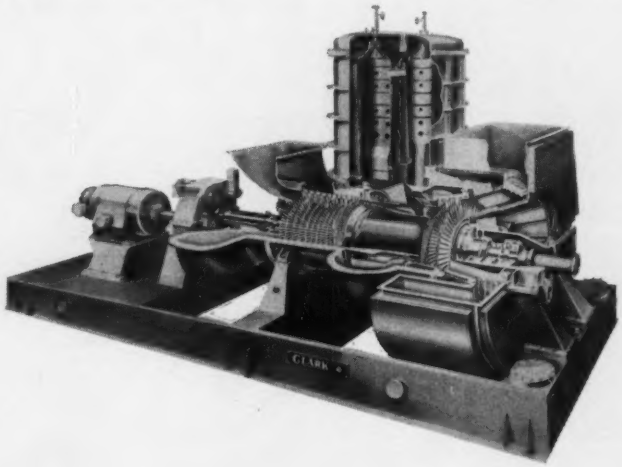


## 6 High Efficiency

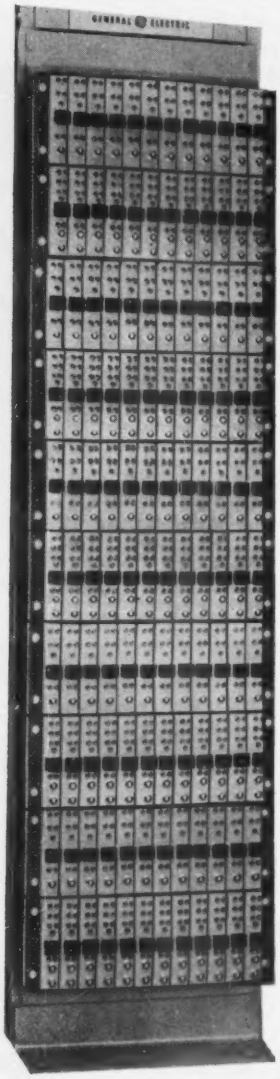
The efficiency of any transmission and distribution system depends wholly upon its components. The high efficiency of Moloney Distribution Transformers, resulting from low total losses, is one of the reasons why Moloney Transformers, installed in your system, afford . . . "More Power To You."

(For further information refer to Readers Service on page 116)

## Gas Turbine . . .



**. . . has NEMA rating of 9,000 bhp.** The unit (Model 305-S) is designed to reduce initial equipment cost, transportation, floor space, foundation, and installation expense. It burns either liquid or gaseous fuels and is capable of continuous operation under full load conditions at normal rated speed of 5,000 rpm. The open-cycle single-shaft model provides a source of rotative power for centrifugal compressors, power generators, and liquid pumps.
**Clark Bros Co, Olean, N. Y.**



## Multiplex-Carrier System . . .

**. . . handles up to 600 voice frequency channels.** The unit has a reduced power drain, taking less than 700 w for a system utilizing 240 channels. Smaller than conventional tubed equipment, the unit has 120 channels in an 8-ft rack space where previously 24 channels could be accommodated.
**Communication Products Dept, General Electric Co, Lynchburg, Va.**

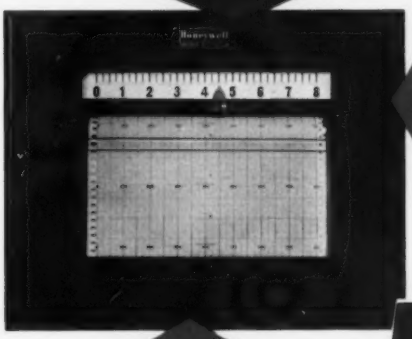
## Distribution Switchboard . . .

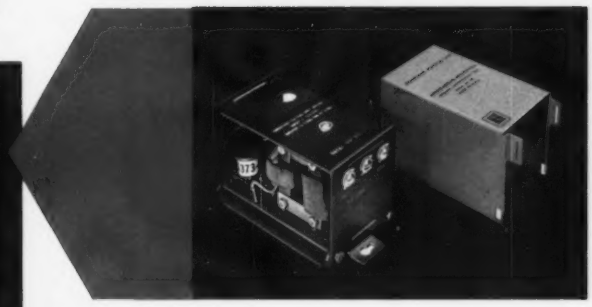
**. . . meets all operating requirements up through 5,000 amp** with quick-make, quick-break switch action. The VFS modular unit uses QMQB switches for applications in buildings where service needs range from 600 through 5,000 amp, 250 and 600 v. It will handle heavy continuous currents and give fault protection on short circuits up to 200,000 amp.
**Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.**

(*More New Equipment on p* 109)

# MODULAR DESIGN MAKES 1960 *Electronik* POTENTIOMETERS A GREATER VALUE THAN EVER

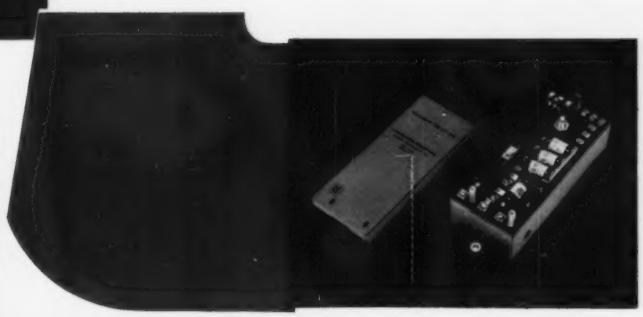
**BALANCING AND CHART DRIVE MOTORS** are sectionalized. Service is simplified because any major part can be replaced in a matter of seconds.





**CONSTANT VOLTAGE UNIT*** eliminates need for batteries, standard cells, and standardizing mechanisms . . . insuring long life.

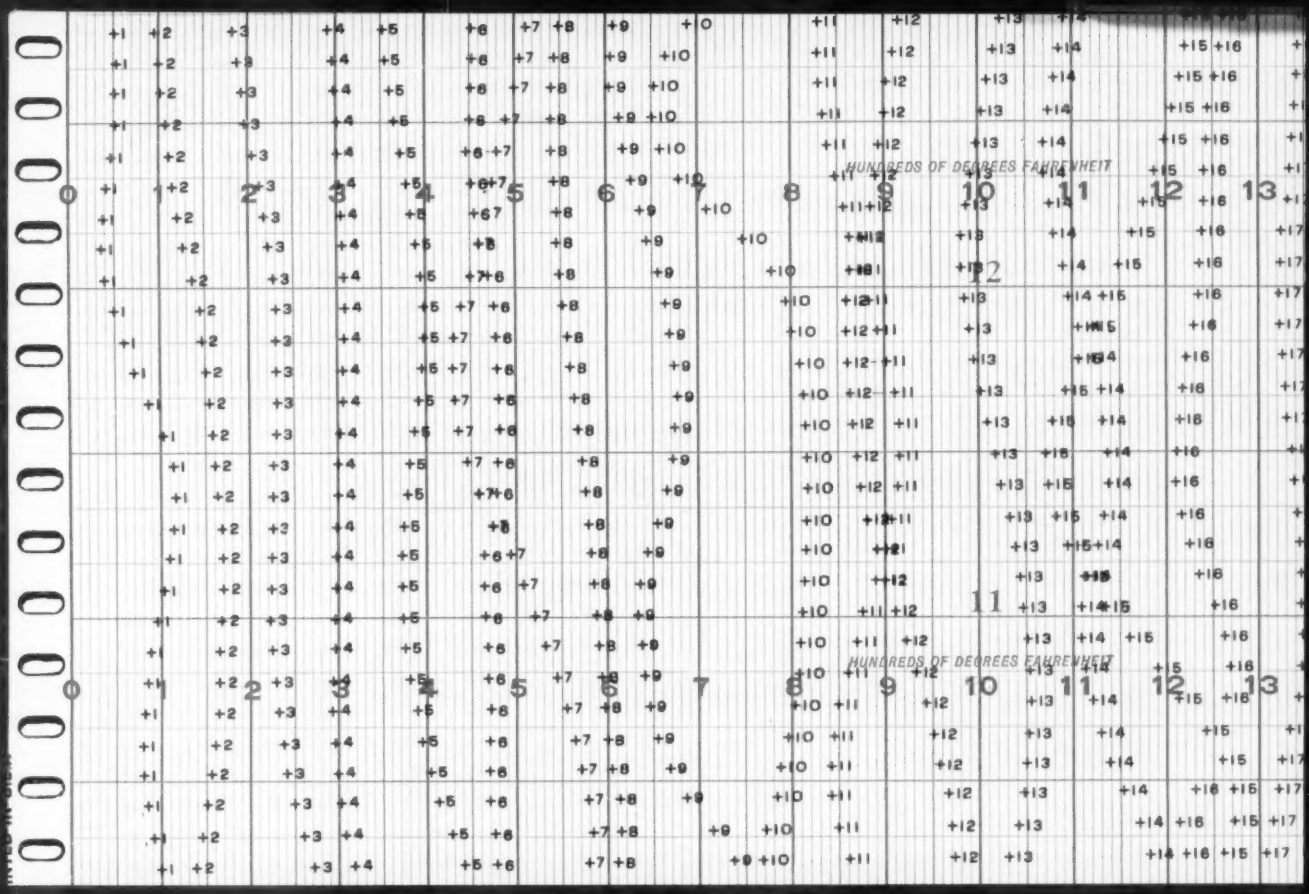
*Zener Diode

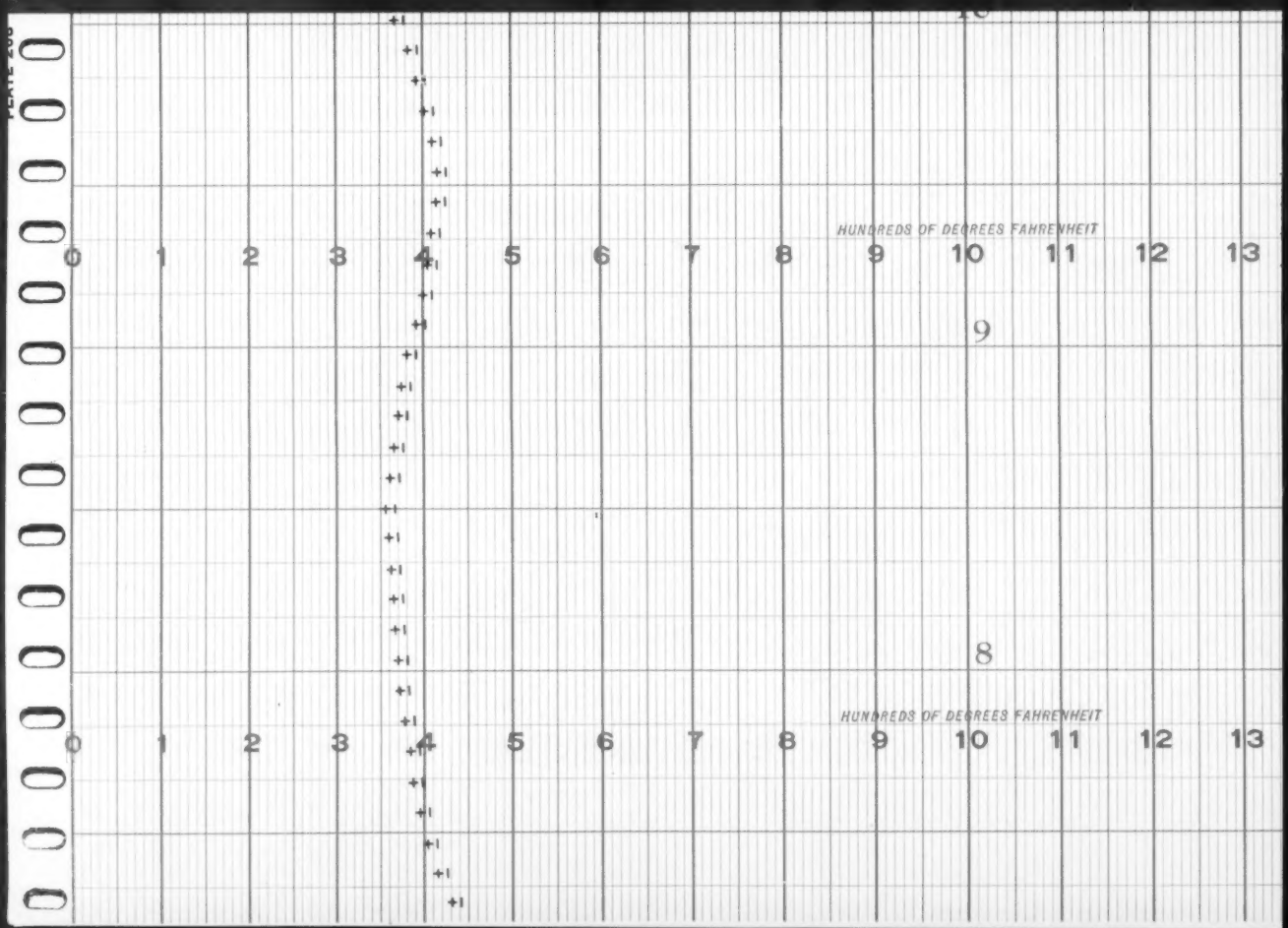


**COMPARTMENTED MEASURING CIRCUIT UNIT** makes range changing easy. Change one screw on a clip connected card of fixed resistors, and the job is done in a matter of seconds.

**QUICK-CONNECT AMPLIFIER** is easily removed from the instrument by means of a polarized plug.

BUT THIS IS JUST PART OF THE STORY OF THE 1960 LINE OF ELECTRONIK POTENTIOMETERS. LOOK AT THE DRASTIC CHANGES IN THE ELECTRONIK MULTI-RECORD RECORDERS.


HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13
12
11
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13


HUNDREDS OF DEGREES FAHRENHEIT
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HUNDREDS OF DEGREES FAHRENHEIT
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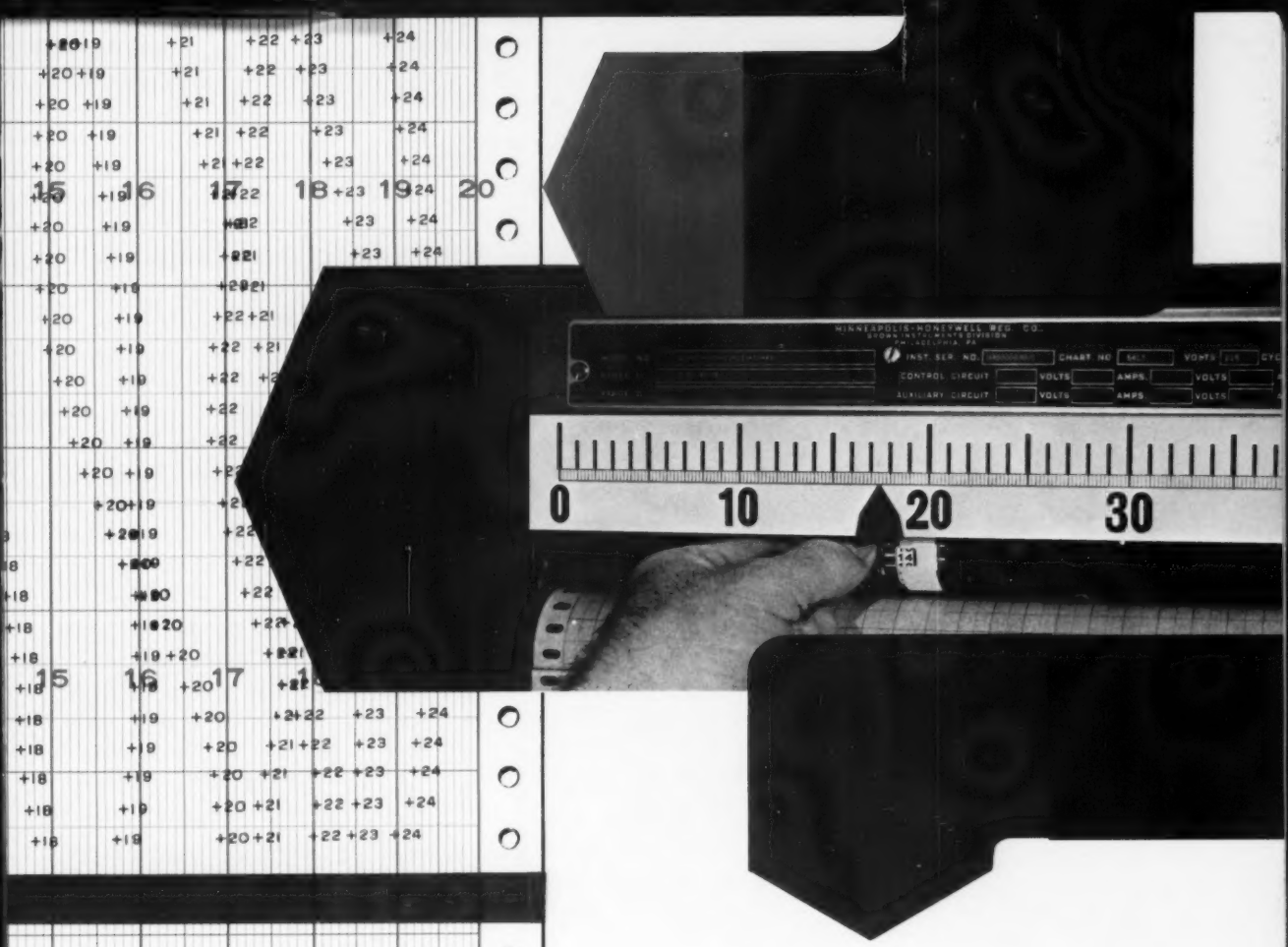



Record 2 to 24 points on one instrument with new UNIVERSAL *ElectroniK*

# MULTI-RECORD INSTRUMENT

Now, you can record 2,3,4,6,8,10,12,16,20, or 24 points on one ElectroniK Multi-Record Instrument... and change the number of points to be recorded in a matter of seconds. It's easy as this: remove a thumb-tight nut and slip off old print wheel . . . and indicator dial. Slip on a new wheel and dial: Replace nut. Plug in the number of points desired, and the job is done.

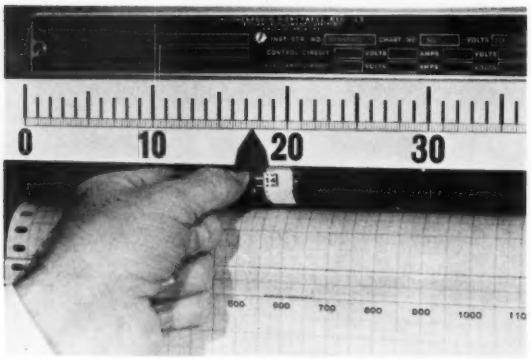
The universal features and modular design of the 1960 line of ElectroniK potentiometers are standard on all multi-record non-control models. Range and compensation changes are quick and easy, too . . . just change the cards.

FROM HONEYWELL... A DIAMOND JUBILEE PARADE OF PRODUCTS

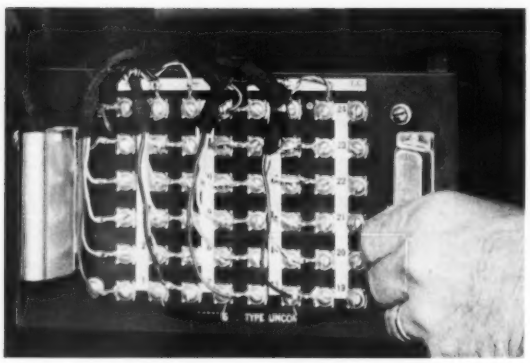
SEE HOW EASY THE 1960 ELECTRONIK MULTI-POINT RECORDERS ARE TO USE...

# all it takes with the 1960 *ElectroniK* MULTI-RECORD RECORDERS to change . . .

. . . number of points recorded



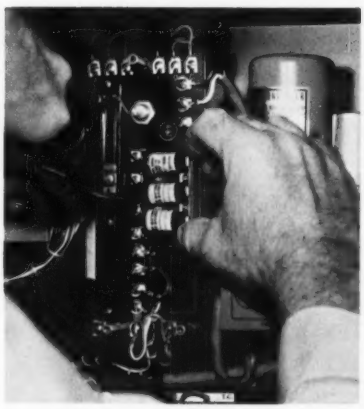

First: remove thumb-tight nut; slip off print wheel and indicator dial. Slip on new wheel and dial and replace nut.

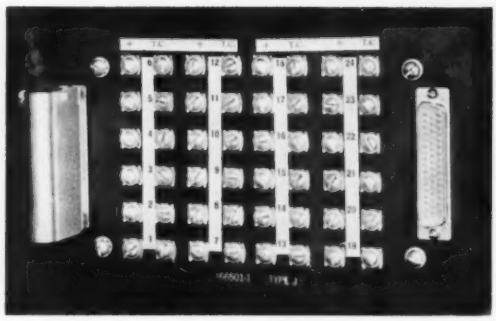


Second: replace one plug-in unit and the instrument is ready to record a different number of points.

The new flexibility and convenience of the 1960 ElectroniK Multi-Record Recorders should interest you. This new design has resulted in substantial manufacturing cost reductions which are reflected in our new price structure. Your nearby Honeywell field engineer has the full details. He's as near as your telephone. Minneapolis-Honeywell, Wayne and Windrim Avenues, Philadelphia 44, Pa.

. . . RANGE—Loosen screws and slide out the range resistor card. Replace with a different card, tighten screws and the job is done quickly and easily.





. . . COMPENSATION—The input terminal board with built-in reference junction comes out by removing one plug. Slide in the new board, replace the screws and plug and the compensation is changed.

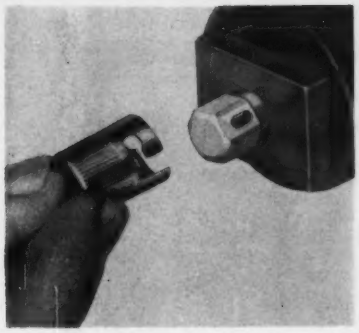
**Honeywell**

*First in Control*

SINCE 1885

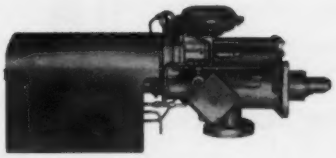
75th YEAR

PIONEERING THE FUTURE



## Disconnects . . .

**. . . are featured** on pole-type transformers and facilitate removal of the transformer cover. The disconnect at the base of the bushing releases the high voltage lead. Positive contact of the bayonet-type disconnect is assured by spring loading the contact surface. Lock pins on the male connector's element are guided into place by channels on the joining cup.
**Kuhlman Electric Co, Birmingham, Mich.**



## Wall Deslagger . . .

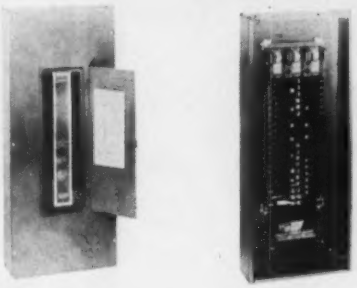
**. . . uses dual air drive** to complete normal cleaning cycle in less than 73 sec. One drive extends and retracts the nozzle; the other rotates it. Nozzle travels are available from 12 to 24 in. The unit (Type RW-3A) has one external stuffing box. A similar deslagger with dual electric drive is available.
**Copes-Vulcan Div, Blaw-Knox Co, 939 W 26 St, Erie 4, Pa.**

## Ground Wire Moulding . . .

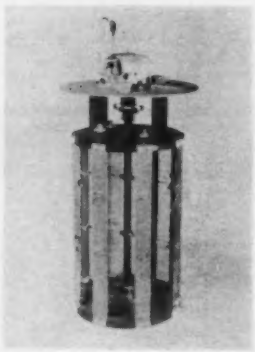
**. . . of Geon, a vinyl plastic,** replaces conventional wood moulding. The high-impact material is flexible and reduces the bulk of wood moulding by a third. Durable, abrasion-resistant and spur-deflecting, the moulding (P-Class) provides excellent insulation and easy installation. Flexible locking flanges on the underside of the half-round extrusion form a tapered slot along its entire length.
**Virginia Plastics and Chemical Co, Roanoke, Va.**

## Load Center . . .

**. . . extends the Stab-lok line** into commercial and industrial applications requiring up to 400-amp mains. This permits using the Stab-lok units in place of more expensive "E" frame breakers. Space for 28



to 42 circuits is allowed in the load center, which is available both in single-phase and 3-phase models for 240-v operation.
**Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.**



## HV Switch . . .

**. . . for electrostatic precipitators** is designed for distributing power from rectifiers to the precipitator electrodes. The switch is a multi-deck rotary type designed to operate in all types of insulating oils. It may be housed in its own compartment, occupying 1 cu yd of space, or it

(*Continued on page* 112)

**Crapo**

**GALVANIZED STEEL STRAND HAS ALL 5**

***1.*** *Strength*
***2.*** *Workability*
***3.*** *Ruggedness*
***4.*** *Long Life*
***5.*** *Economy*

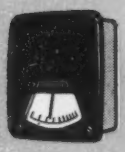
When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

*Crapo* Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

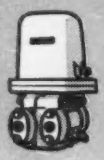
**For details, ask our distributor or write direct!**

**INDIANA STEEL & WIRE COMPANY, INC.**
Muncie, Indiana



**Indicating Motion-Type Transmitters**

...for flow, pressure, and level



**Low Displacement Force-Balance Transmitters**

...for flow, pressure, and level

**Thermocouple and Resistance Bulb Converters**

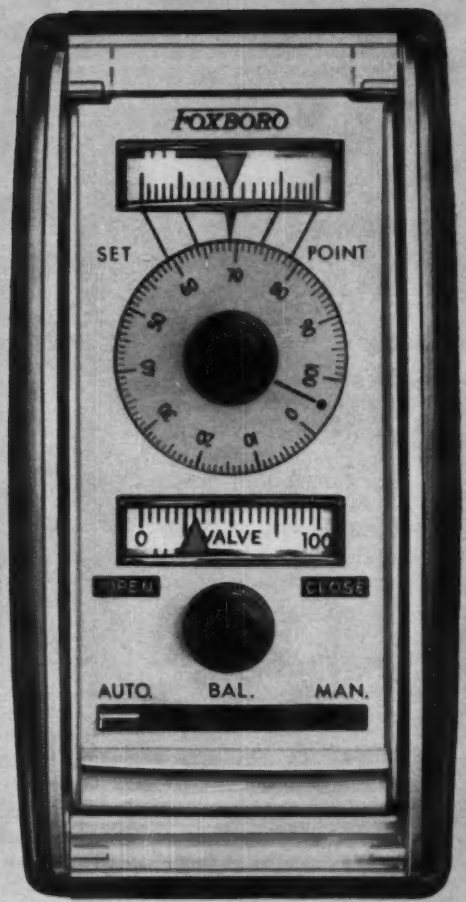
...magnetic amplifiers...no vibrators
...no mechanical rebalancing

**Displacer Level Transmitters**

...force-balance for simplicity

**Control Valves**

...electro-pneumatic and electro-hydraulic actuators

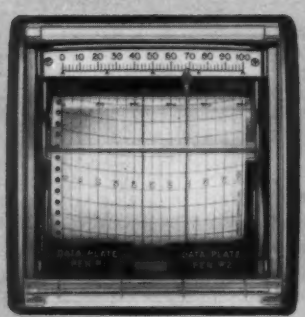



**CONTROLLER**

The Electronic Consotrol Controller (shown 4/5 actual size) concentrates all control and supervisory functions in one slim 3 x 6 inch case. Controller operation is entirely independent of recorder.

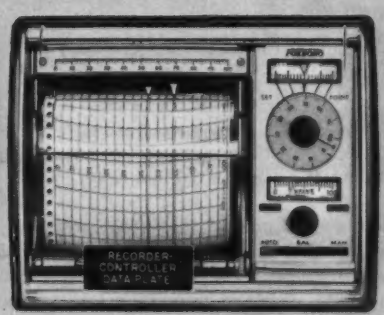
# FOXBORO Electronic

REG. U.S. PAT. OFF.



**RECORDER**

Electronic Consotrol Recorders (shown ¼ actual size) use a simple, powerful pen motor which can be operated directly from transmitter signal without amplification. Available in 1 and 2 pen models.




**COMBINED RECORDER-CONTROLLER**

Electronic Consotrol housing design permits unequalled flexibility in panel arrangement. Recorders and controllers can be mounted separately in individual housings—or enclosed in a compound unit. Regardless of mounting, either unit pulls out independently.

# for the first time... the 100% solid state electronic system!

- thermocouple and resistance bulb converters-using magnetic amplifiers
- choice of force-balance and motion-type transmitters
- long time-constant tubeless controllers

## Consotrol Instrumentation

Electronic Consotrol* Instrumentation—the most complete and advanced family of electronic-operated measurement and control instruments available today! That just begins to describe Foxboro's dramatic new advance in instrumentation. ✓ ✓ ✓ Foxboro electronic transmitters, indicators, recorders, control stations, computing stations, valve actuators and other final operators cover every function in the control loop. All are linked by a d-c current signal. All are completely tubeless. Even thermocouple and resistance-type systems no longer require vacuum tubes. ✓ ✓ ✓ Electronic Consotrol systems convert temperature, pressure, flow, level, and other measurements, to a proportional signal **at the transmitter.** Transmission to a remote control station is instantaneous. Designs are available for both hazardous and non-hazardous areas. ✓ ✓ ✓ Electronic Consotrol Instrumentation heralds a whole new era in process control engineering. Write Foxboro today for the new 32-page Catalog 21-10 which gives full details. **The Foxboro Company,243 Norfolk St., Foxboro, Mass., U. S. A.**

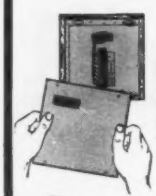
*Reg. U.S. Pat. Off.

GTC

UNITIZED
COMMUNICATION EQUIPMENT for POWER and INDUSTRY

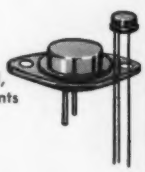
Effective! Reliable! Economical!

1 Highly effective in extremes of ambient noise and temperature.



2 Plug-in units provide ease of installation, expansion and maintenance.

3 Transistors and rugged, industrial type components used throughout.



4 Central control cabinet, costly engineering and fabrication eliminated.

Wherever a highly dependable, voice communication system for use in high noise level areas is needed—you'll find GAI-TRONICS specified by name.

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

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READING, PENNA.

GAI
FOUNDED 1926

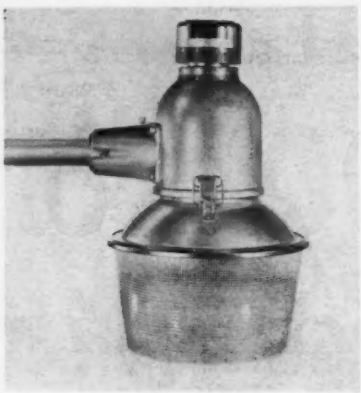
A SUBSIDIARY OF GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

## HV Switch . . .

(*Continued from page* 109)

may be immersed in the same compartment as the transformer-rectifier, in which case the transformer-rectifier compartment is lengthened or widened about 2 ft. It is engineered for 100,000 v and 1 amp application.

**Buell Engineering Co, Inc, 123 William St, New York, N. Y.**



## Luminaire . . .

. . . **with a plastic refractor** is available for use in rural or suburban lighting. The Acrylic-Suburban unit is constructed with built-in ballast for up to 250-w mercury vapor lamps or without ballast for up to 6,000-lumen filament lamps. Unaffected by corrosive atmospheres, the refractor resists thermal shock and is interchangeable with glass refractors of similar design.

**General Electric Co, Schenectady 5, N. Y.**

## Neoprene Paint . . .

. . . **provides protective coating** upon application by brush or spray to metal, wood, plastic, and concrete. The self-vulcanizing liquid, called APCO Liquid Rubber Paint, is not affected by climatic changes or by water, oils, gasoline, naphtha, acids, alkalies, or most solvents. It protects against rust, mildew and fungus.

**Adhesive Products Corp, 1660 Boone Ave, New York 60, N. Y.**

## Trencher . . .

. . . **and backfill machine** digs 3 to 4 in. wide down to 66 in. deep; or 12 in. wide, 30 in. deep; and at varying widths and depths in between. The machine (Model T-66) features positive traction obtained by the use of tracks instead of pneumatic tires. Trenching speed is from one to 12 ft per min. A backfill blade is attached to the boom and is raised or lowered hydraulically.

**Davis Mfg, Inc, 1500 S McLean Blvd, Wichita 13, Kan.**

## Electronic Computer . . .

. . . **combines versatility, speed and low-cost** in an all-transistorized, desk-size model. The unit, Control Data 160, with a magnetic core, handles data transmissions to and from input-output equipment at speeds of up to 65,000 characters per sec. A single-address computer with high-speed parallel mode of operation, the unit has a repertoire of 62 instructions and complete programming package.

**Control Data Corp, 501 Park Ave, Minneapolis 15, Minn.**

(*More New Equipment on p* 114)

# ALLIS-CHALMERS

*"Originators of 5/8% Step Regulators"*

*Caliband* is an Allis-Chalmers trademark.

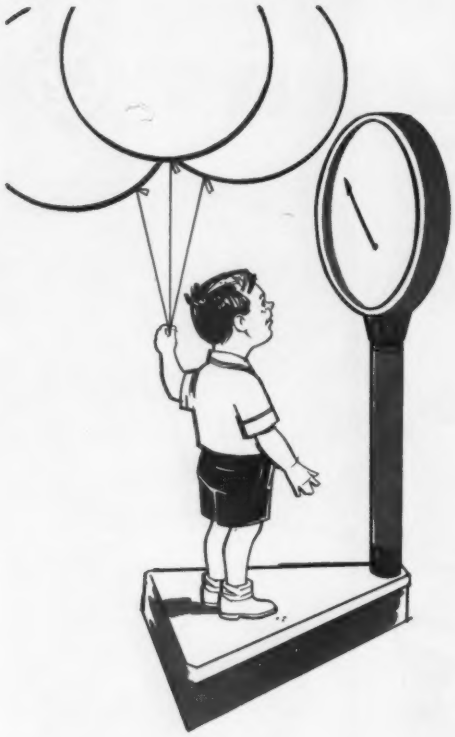
# Lower! Lighter! Perfect for joint-pole use

## new JFR regulators cut installation costs

**CALIBAND control slashes** setting time without changing customer voltage or interrupting service! A twist of the knob and you set or test voltage level and band width No need to return compensator settings to zero.

**Allis-Chalmers all-new JFR is the top qualifier** for joint-pole use . . . pad or platform mounting. Tank size and weight reduced up to 33%, due to JFR's improved materials and design techniques. Naturally, you save on transportation, handling and installation.

More new JFR advantages! Now offered as *standard,* position indicator drag hands reset by pushbutton on the control panel. A new, quick-sight gauge instantly reveals oil level. Exclusive unidirectional breather removes all moisture and contaminating gases. And a new cover, with hidden bushing mounting studs, cuts maintenance. *For all the facts ask your nearby A-C office for new JFR Bulletin 21B7977E or write* **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1261



# don't let the numbers fool you

The hi-pot rating of a photoelectric streetlight control (the maximum *sustained** voltage it can take between its electrical and mechanical connections without breakdown) is important. If the hi-pot isn't high enough, the control may be an unexpected weak link in the system, behaving like a fuse instead of a switch.

Naturally the hi-pot rating of a control should be qualified by a description of the test method used. When a high, stiff voltage is applied to the control and "ground", the test is honest—but dangerous. A common practice is to insert a current-limiting resistor (on the order of 10 megohms) to take care of the danger—but then even a little leakage in the control will cause a big drop in the applied voltage, with the result that the hi-pot rating is falsely high. The voltage at the control is substantially less than the applied voltage as read on the meter, just as the indicated weight of the buoyed-up boy in the picture is less than his actual weight.

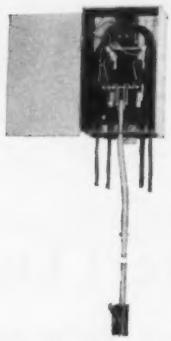
To get a "true" hi-pot rating, we eliminate the resistor and carry out the test in an insulated box which provides the necessary protection. Thus the voltage read on the meter *is* the same as that across the control. The new F-P bakelite-chassis 6600A controls will withstand a hi-pot test of at least 9 KV—honest. The Fisher-Pierce Co., 82 Pearl Street, So. Braintree 85, Massachusetts.

*as contrasted to "flash-over" effects caused by extremely brief, high voltage peaks.

FP
FISHER PIERCE
PHOTOELECTRIC LIGHTING CONTROLS
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

## Centrifugal Fans . . .

**. . . have eliminated vibration** and resonant noise, as motors and fan bearings are mounted on rubber isolation rails. The self-contained, belt-driven units (Type BU and FU) also feature wide adjustability and allow mounting of several motor frames on one standard base. They are designed for applications requiring low and medium ranges of volume and pressure.
**Ilg Electric Ventilating Co, 2850 N Pulaski Rd, Chicago 41, Ill.**

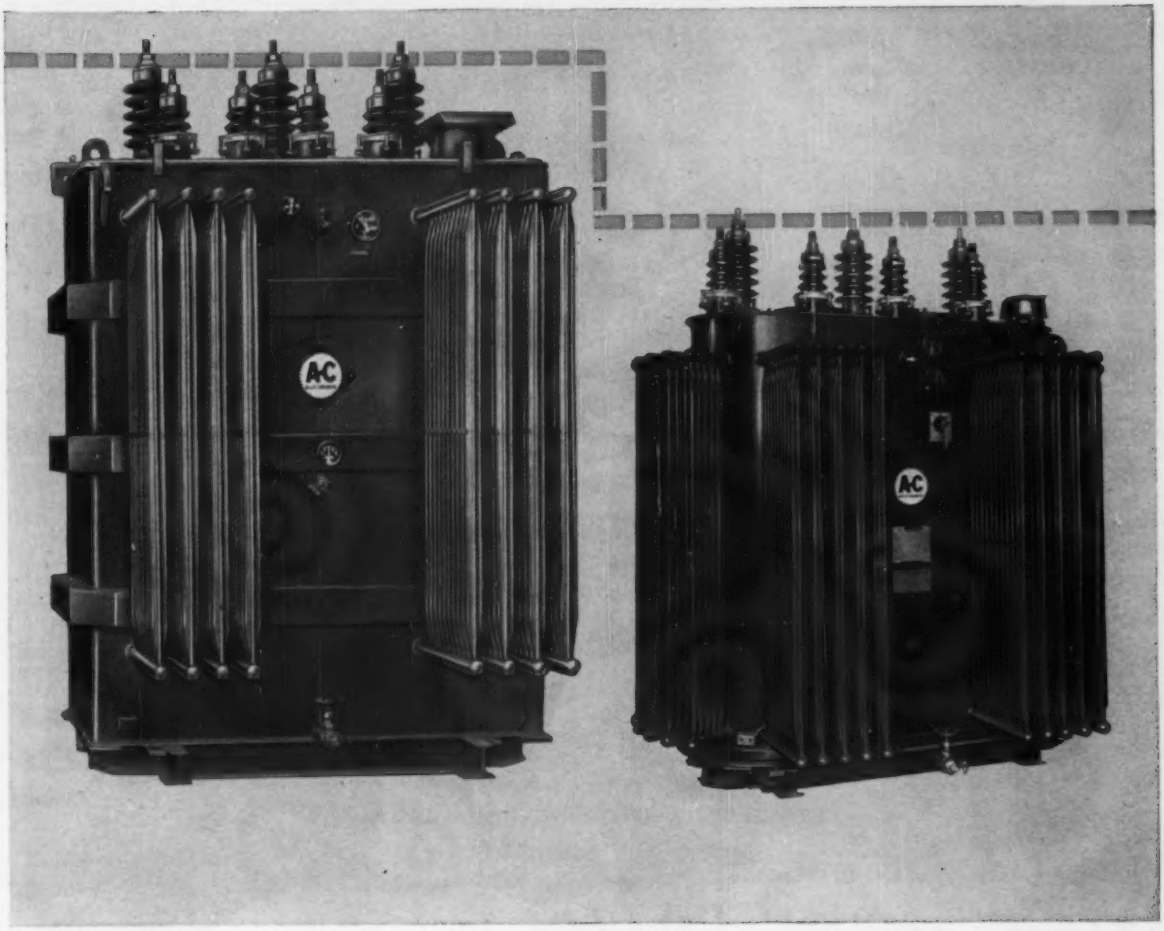


## Yard Pole Switch . . .

**. . . provides 200-amp,** single-phase service with ground-level disconnect control. Economy is gained through elimination of heavy wire, fittings, and conduit runs required for meter loop. The weatherproof cabinet, housing a knife switch and a 200/5 ratio current transformer, is mounted at the top of the distribution pole.
**Hoffman Engineering Corp, Anoka, Minn.**

(*More New Equipment on p* 118)

# ALLIS-CHALMERS



## New Allis-Chalmers small power transformers

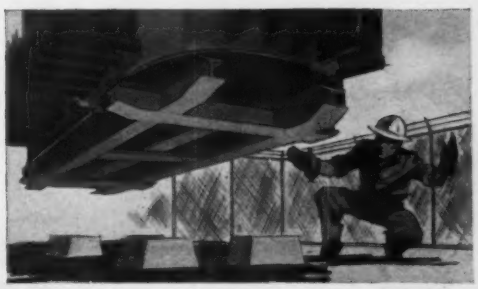
### are easier to install because they're 30% lower, lighter too!

Goodbye to building high-cost foundations — engaging extra-heavy-duty handling equipment — all to install "small" power transformers.

**All new** — these lighter, lower units by Allis-Chalmers bed down on a thinner pad, low-cost piers or concrete planks. Handling is simplified by the weight-saving design. (The 34.5-kv, 3750-kva transformer, for example, has had its weight reduced by 8000 lb.)

**Easier servicing** is another basic advantage of this new design that also reduces losses, exciting current and noise level. The unit is reinforced from the inside, offering a smooth, clean appearance — no disfiguring, dirt-gathering external bracing.

*Get the complete story from your nearby Allis-Chalmers office or write* ***Allis-Chalmers,*** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1237



**New base design** permits mounting these new A-C power units on smaller foundation structures. This newest transformer also offers grouped instrument arrangement for easier reading, and self-resetting mechanical relief device.

# Readers Service

**For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:**

**NEW EQUIPMENT**

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GE.....Carrier System ☐
Federal Pacific.....Switchboard ☐
Kuhlman .....Disconnects ☐
Copes-Vulcan .....Deslagger ☐
Virginia Plastics .....Moulding ☐
Federal Pacific.....Load Center ☐
Buell .....Switch ☐
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Adhesive Products .....Paint ☐
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Ilg .....Fans ☐
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**OTHER**

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**MARCH 21, 1960**



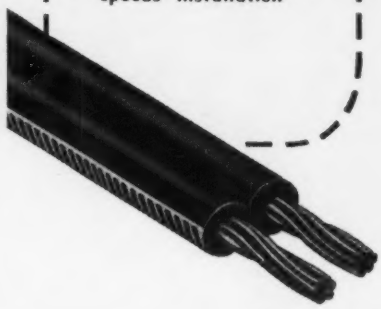

**From regulator to lamp**
*. . . use cost-saving*
**SUPERIOR CABLES**

**Thermoplastic Series Lighting Cables**

- High resistance to earth acids and alkalis
- High resistance to sunlight, moisture, weather
- Small diameter, lightweight
- Easy to splice

**Figure 8 Pole & Bracket Cable**

- High resistance to abrasion, mechanical damage
- Does not deteriorate with age or weather
- Will not support combustion
- Flexible, strips clean, speeds installation



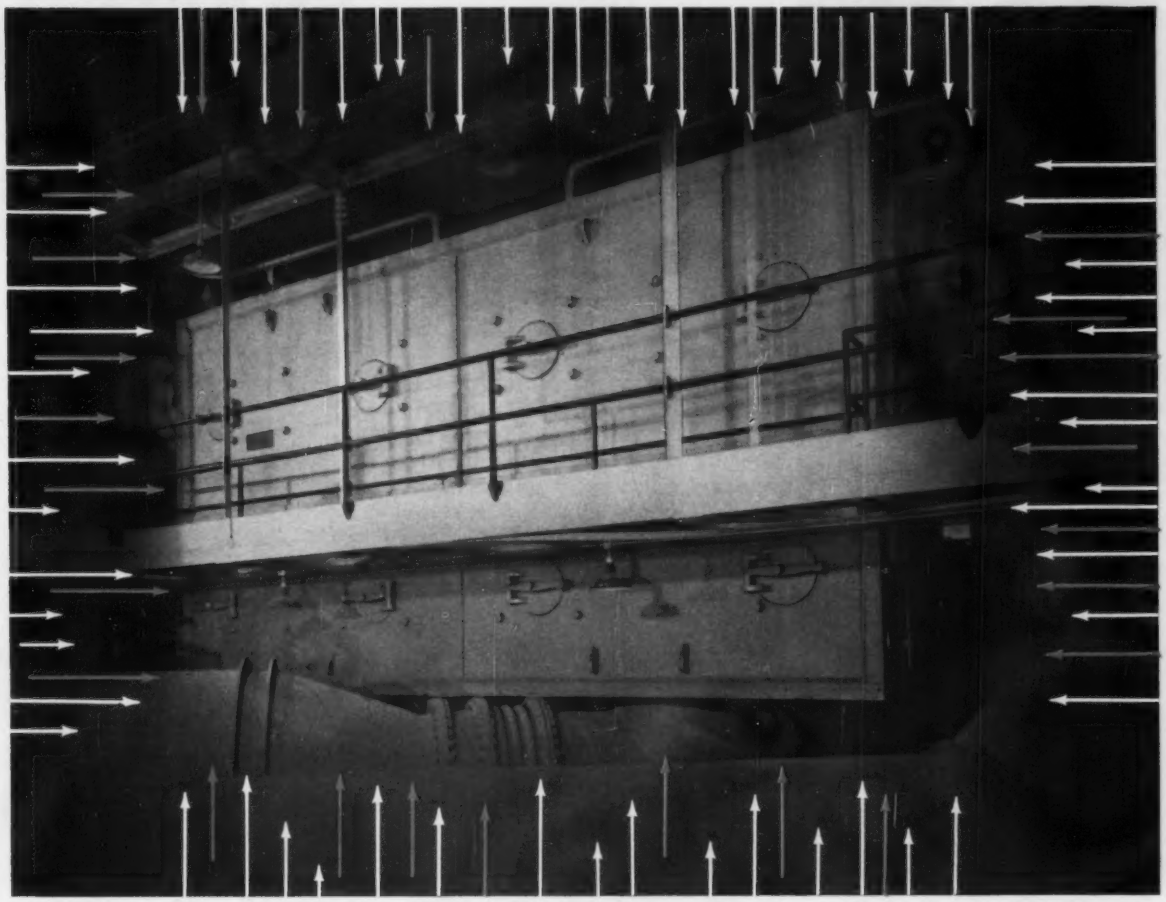
Performance and economy go hand in hand with SUPERIOR plastic insulated and jacketed cables.

All SUPERIOR CABLES are quality-engineered, precision manufactured and thoroughly tested.

From regulator to lamp . . . for low initial cost . . . for less maintenance cost . . . order SUPERIOR CABLES!

*For complete information and prices, write*
**SUPERIOR CABLES**
SUPERIOR CABLE CORPORATION
Hickory, North Carolina
3869

# ALLIS-CHALMERS



# No space problem here!

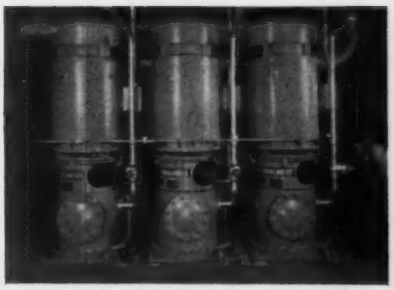
## Another utility installs an Allis-Chalmers surface condenser

**Illinois Power Company** installed an Allis-Chalmers 125,000-sq-ft, two-pass, divided water box surface condenser at its Hennepin Station (Unit 2). Improved design resulted in space saving and reduced installation costs.

A-C special cars carried unit in just three shell sections to simplify shipping, speed on-site handling and minimize erection. Extra-compact rectangular condenser shape reduced space requirements. And Allis-Chalmers unique reverse flow design for cooling water effectively back-washes debris, ends costly shutdown, conserves space, requires no additional piping.

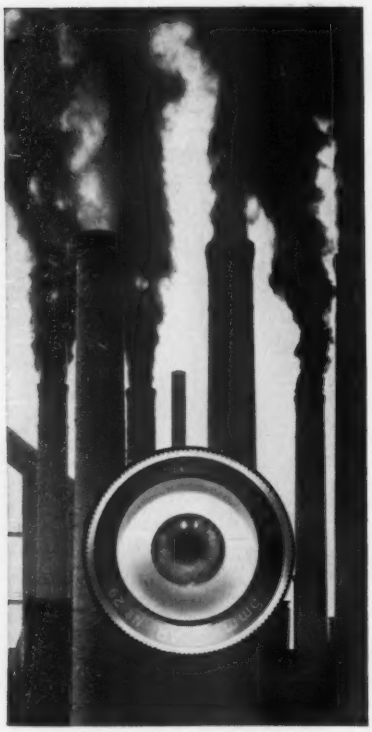
*For details on compact A-C condensers from 100 to 200,000 sq ft and larger, call your nearby A-C office or write* ***Allis-Chalmers,*** *Power Equipment Division, Milwaukee 1, Wisconsin.*

**Allis-Chalmers circulating pumps** with vaned elbows allow use of smaller inlet tunnels and permit adjacent pumps to be located closer together. Result, considerable saving in overall space requirements.



**Allis-Chalmers vertical condensate pumps** also save space. With the first stage impeller located below floor level, the required NPSH can be gained in the pump tank. This feature permits a shallower basement.

A-1274



GPL closed-circuit TV fills hundreds of business needs today for such companies as Bell Aircraft, Brookhaven National Laboratory, Chrysler, Consolidated Edison, Convair, Firestone, General Motors, Link Aviation, Martin, New York Savings Bank, U. S. Steel.

# how many jobs

could GPL Industrial TV help **you** do better?

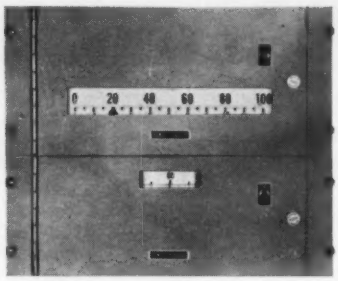
**You'll never know until you investigate!** You'll be amazed at the versatility, simple operation, and low cost of Industrial TV systems by GPL, one of the world's leading manufacturers of industrial, military and broadcast TV.

Write us today for free, illustrated brochure on GPL—the most complete line in the industry.

**GPL** DIVISION
GP
**GENERAL PRECISION** INC.
PLEASANTVILLE, NEW YORK

## Street Lighting Relay . . .

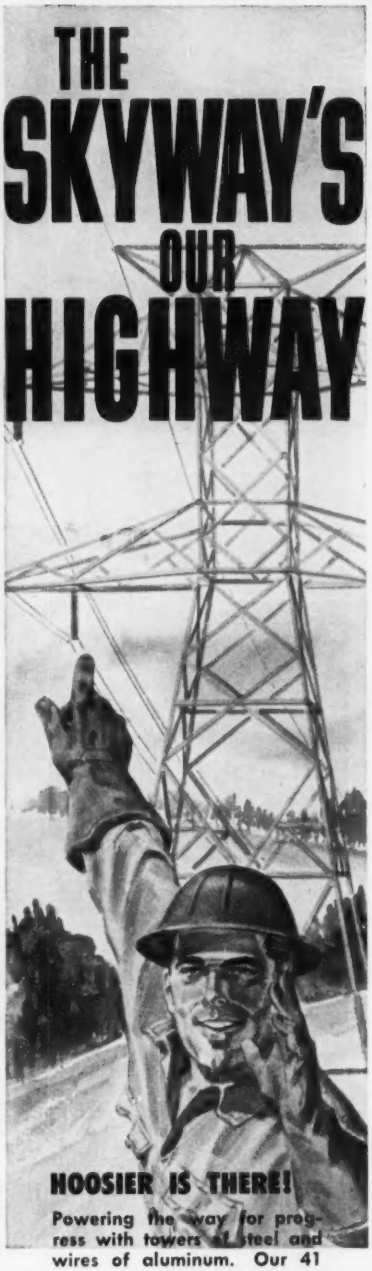
**. . . for photoelectric controls** solves the need for a 30-amp tubeless photoelectric control for new installations and for replacement of existing 30-amp meter socket controls. The relay has a locking-type receptacle mounted in the lid into which any 1,000-w tubeless control which meets the EEI-NEMA specifications can be installed to act as the sensing element. It is offered with either a mercury plunger-type load contactor or an open-type relay. Lightning protection as well as a 30-amp load fuse is standard.
**American Electric Mfg Co, 3271 Chelsea Ave, Memphis, Tenn.**



## Servomechanisms . . .

**. . . mounted in hinged swinging panels** to fit standard 19-in. relay racks can be used in computing and control systems. Model 692, with a 22-in. drum-scale, has a slidewire balancing shaft to provide for mounting a retransmitting slidewire or alarm contacts. Model 694 uses an 11-in. scale.
**The Bristol Co, Waterbury 20, Conn.**

(*More New Equipment on p* 120)


Powering the way for progress with towers of steel and wires of aluminum. Our 41 years of quality, integrity and service are your guarantee of the finest in transmission and distribution line erection and maintenance. Our complete facilities brochure is available without obligation.

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ENGINEERING CO.
1350 HOLLY AVE. • COLUMBUS 8, OHIO

# ALLIS-CHALMERS

This installation is repeated on 160 power systems.

## It's well underway...the big swing to breakers with Pneu-Draulic operators

**Here's how confidence adds up.** An innovation scarcely six years old has won the acceptance of 160 companies — and over 60% have placed repeat orders. That's the dramatic record of the reliable *Pneu-Draulic* operator available on Allis-Chalmers outdoor breakers (14.4 to 345 kv, 500 to 25,000 mva).

**Reliable stored energy** assures safe emergency closing of breaker at full rated speed onto energized line (even when no control power is available). Use of non-compressible oil instead of air ends use of trouble-causing anti-freeze solutions, eliminates moisture and corrosion problems. And, you get these additional benefits — mechanically trip-free operation, high-speed interruption.

Join the big swing to A-C breakers with low-maintenance *Pneu-Draulic* operators. Call your nearby A-C office or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

A-1249

ANNOUNCING

PENGO-Prope

—the most satisfactory pulling line available today!

* GREAT STRENGTH
(9,600 lbs. tensile for ¾" diam.)

* LIGHT WEIGHT
(11.7 lbs. per 100 ft., ¾" diam.)

* HANDLES AND SPLICES LIKE MANILA
in any climate or weather.

* WATERPROOF,
(even salt water) can't mildew; excellent dielectric properties.

PENGO-Prope is a synthetic rope of special construction for pulling line use; no other rope can match its safety and cost-saving performance! Write today for literature, prices.

PENGO-Miller
LINE STRINGING SWIVELS

Special models of the well-known MILLER swivels redesigned specifically for tension line stringing use.

The result is a reliable, heavy duty swivel of proper dimensions to pass through stringing sheaves and bullwheel grooves easily, without damage.

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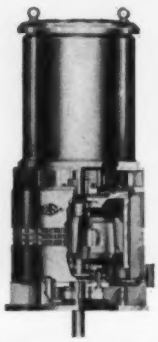
PETERSEN ENGINEERING CO., INC.
Santa Clara, California
Phone: AXminster 6-7712

B-10

## Metering Kit . . .

**. . . holds an Amprobe snap-on volt-ammeter** and accessories in a 7½x 10x2½-in. case. The Model TM-33 test kit contains an Amprobe RS-3 snap-around volt-ammeter-ohmmeter with five current ranges and three voltage ranges, an Amprobe Deca-tran which extends amperage readings 10 times, and an Amprobe Energizer which multiplies the sensitivity of any Amprobe 10 times.

**Pyramid Instrument Corp, 630 Merrick Rd, Lynbrook, N. Y.**



## Magnetic Drives . . .

**. . . for pump drive application** are available in five sizes. The vertical, air-cooled drives, called "Ampli-Speed," provide pumping speeds from 0 to 1740 rpm. They have sensing controls which can be used to make the pump operation automatic.

**Electric Machinery Mfg Co, Minneapolis 13, Minn.**

(*More New Equipment on p* 124)

NEW KLEIN CATALOG

Here is the 1960 edition of the Klein catalog illustrating and describing the complete line of Klein tools and equipment for electricians.

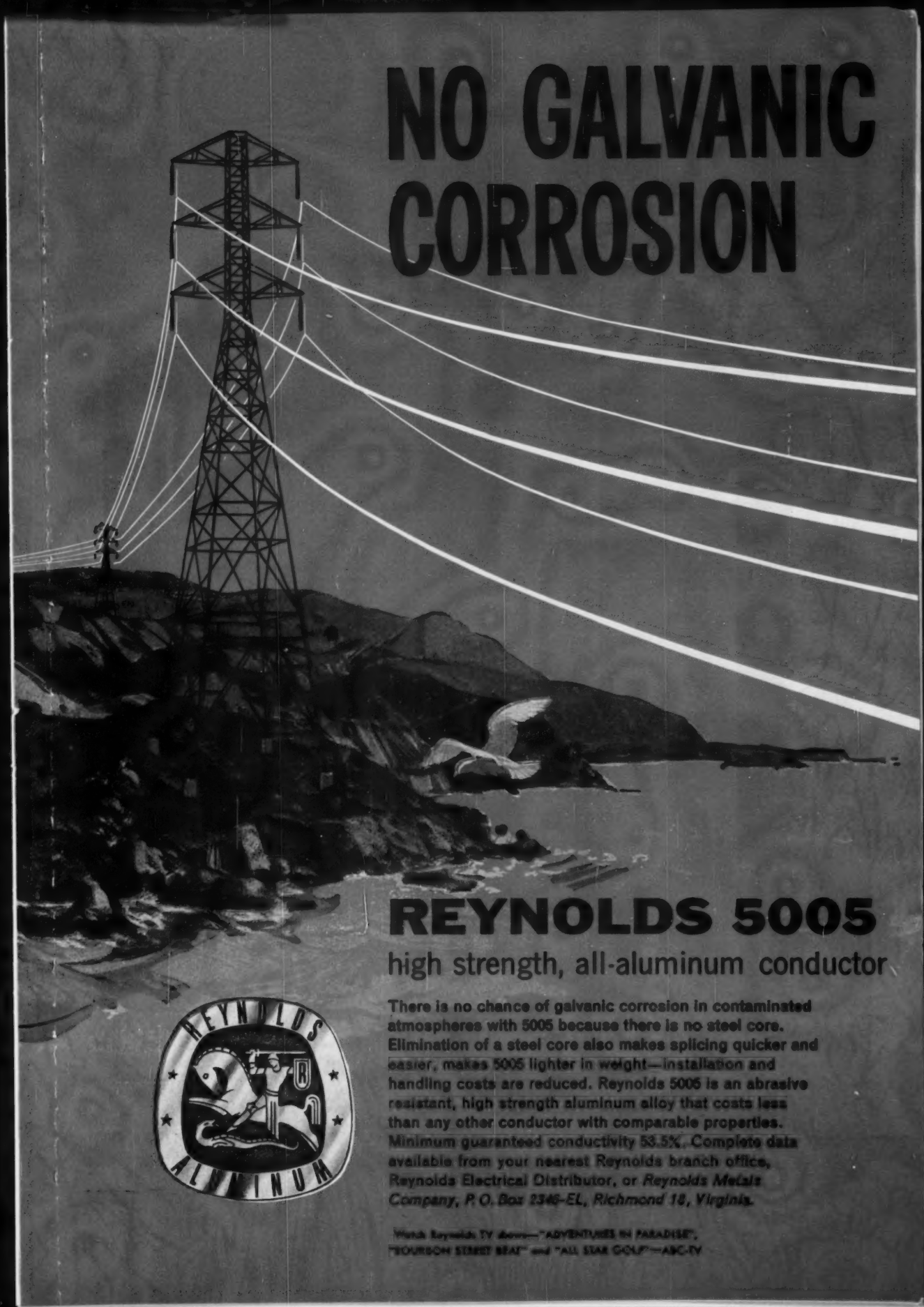
It contains many new additions to the Klein line—including Replaceable Gaff Climbers, a newly developed Hot Line Grip and an even wider range of pliers for every purpose.

The Klein Catalog 103 will be of interest to linemen, electricians —good workmen everywhere.

**Write for yours.**

Foreign Distributor: International Standard Electric Corp., New York.

Mathias Established 1857 KLEIN & Sons Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS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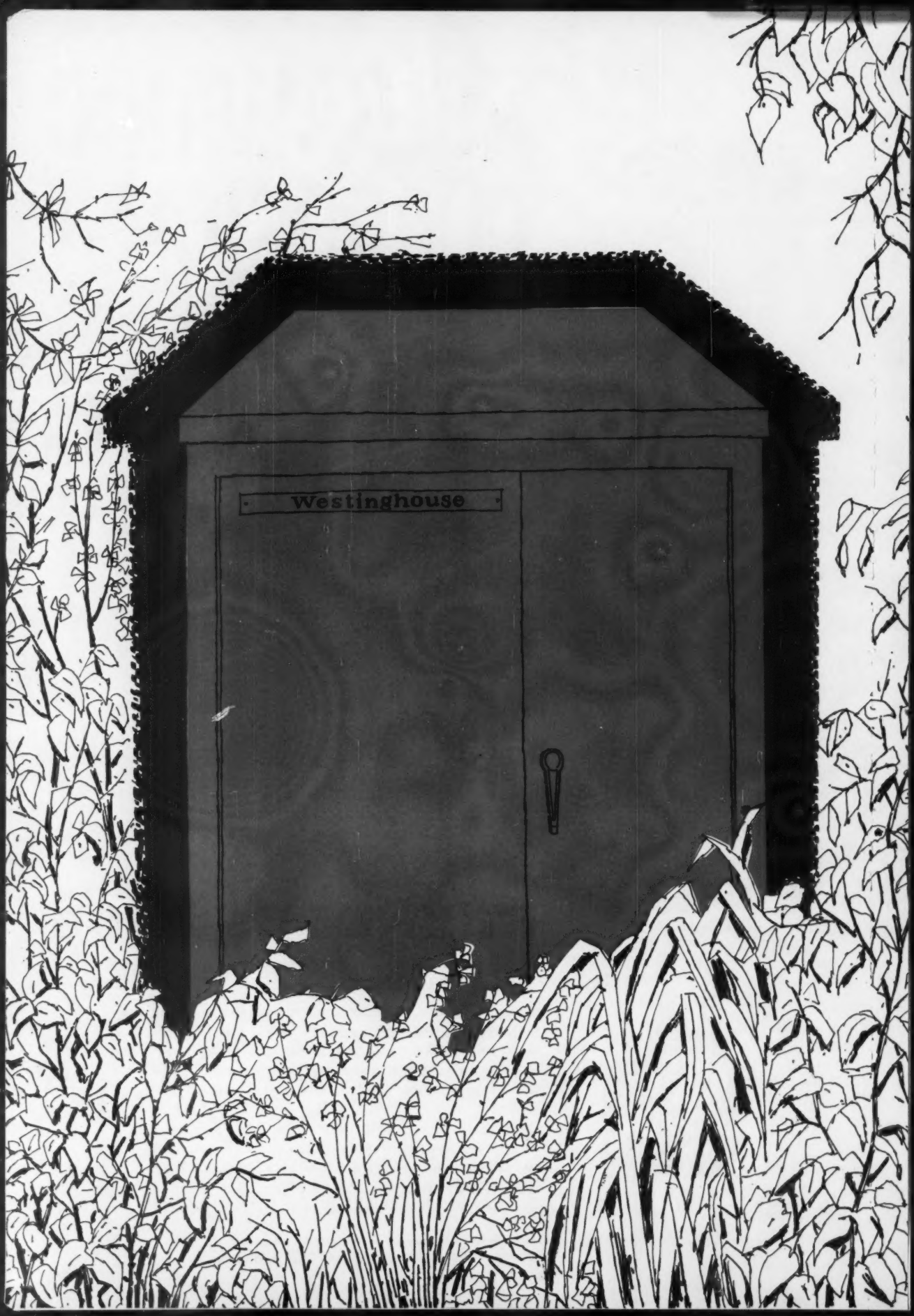
REYNOLDS 5005
high strength, all-aluminum conductor
There is no chance of galvanic corrosion in contaminated atmospheres with 5005 because there is no steel core. Elimination of a steel core also makes splicing quicker and easier, makes 5005 lighter in weight—installation and handling costs are reduced. Reynolds 5005 is an abrasive resistant, high strength aluminum alloy that costs less than any other conductor with comparable properties. Minimum guaranteed conductivity 53.5%. Complete data available from your nearest Reynolds branch office, Reynolds Electrical Distributor, or Reynolds Metals Company, P.O. Box 2346-EL, Richmond 18, Virginia.
Watch Reynolds TV shows—"ADVENTURES IN PARADISE", "BOURBON STREET BEAT" and "ALL STAR GOLF"—ABC-TV
REYNOLDS
ALUMINUM


Westinghouse

# Westinghouse offers a complete line of pad mounted transformers for residential underground distribution...

Wherever new residential developments justify the installation of underground distribution services, you can look to Westinghouse to supply all your needs. A complete line of primary service and utilization transformers is available for mounting on concrete pads in residential areas. Units are completely safe for residential installation. Low profile permits easy camouflaging with shrubs and planting. Furnished in light or dark gray or forest green.

For more detailed information about this line of transformers, currently in production, call your Westinghouse sales engineer or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

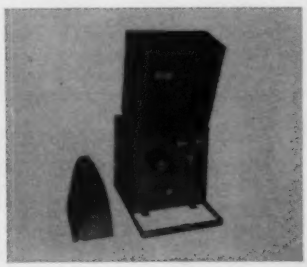
J-70939

YOU CAN BE SURE...IF IT'S **Westinghouse**

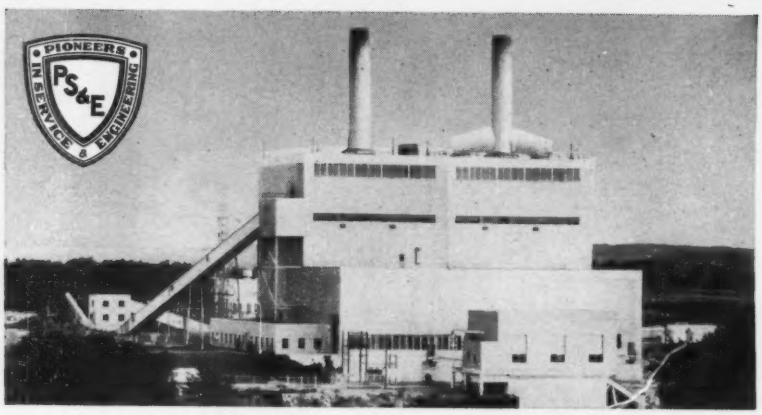
WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

*Primary Service Unit* utilizes oil-filled core and coils. Self-contained unit features detachable high- and low-voltage compartment. Thermal protection is provided by a low-voltage breaker (available less breaker). Dummy bushing in H.V. compartment accommodates visible disconnect. Transformer can be equipped with magnetizing break switch for use on primary loop feeder. Normally mounted at rear of lot.

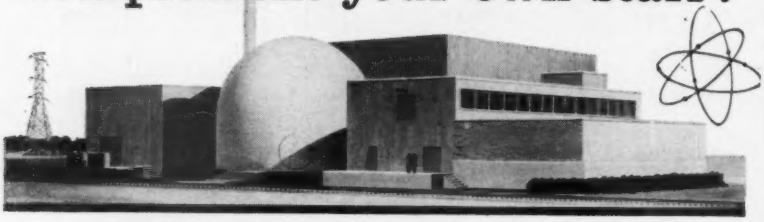
*This Primary Service Housing* provides maximum flexibility in the pad mounting of standard components for transformers 5 through 50 kva, wall or cover design. Standard housings available from stock. Switching operations can be accommodated with addition of a CSL (200-amp load break) switch with visible disconnect. High- and low-voltage compartments separately locked. Barriers effectively isolate live parts. Space available for selector switch installation.

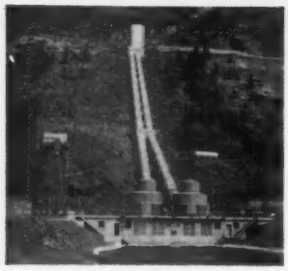


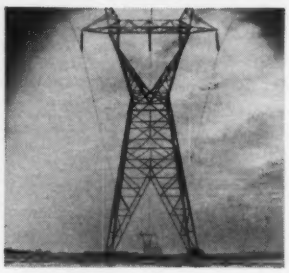
*Utilization Transformer* is a self-contained oil-filled unit for installation *at the house*. Transformer serves one residence . . . eliminates secondary lines and regulation problems. Use with radial or loop feed. All switching or fusing provided at loop. Your lowest cost underground installation in serving 100- to 200-amp loads. One style will serve an entire development to provide complete interchangeability.




**Which Pioneer service do you need to complement your own staff?**







**DESIGN AND CONSULTING ENGINEERING SERVICES**

Pioneer specializes in designing power plants and offers design service for fossil fuel, hydro and atomic plants. It will also assist in forecasting load growth, in site selection, in purchasing and expediting of equipment and construction management. Pioneer's other services include substation, transmission and distribution studies and design.

**SERVICES IN REGULATORY MATTERS**

Pioneer offers its services in all phases of Federal, State and local utility regulation, including natural gas and electric rate matters, certificate proceedings, licensed project accounting requirements, depreciation studies for rate case and income tax purposes, cost allocations and special studies.

**CORPORATE SERVICES**

Pioneer offers its services as business and management consultants; stock transfer and dividend disbursing agents; financial, accounting and tax consultants.

Write for Booklet "PIONEERING NEW HORIZONS IN POWER"

*Serving Electric Utilities and Industrial Power Users Since 1902*

**Pioneer Service & Engineering Co.**

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## More New Products

Chemically-inert plastic **tape** is designed to seal and to permanently lubricate threaded and coupled pipe joints. Called "Scotchrap" brand Dry Thread Sealer No. 4212, the unfused film tape conforms to all types of pipe threads.—Minnesota Mining & Mfg Co, 900 Bush Ave, St. Paul, Minn.

Portable **gas detector** (Model 521) gives indications and alarm when gas concentrations reach danger levels. Unit can also be operated as fixed indicator alarm with up to 100 ft of cable to detector element. —Houston Instrument Corp, Box 22234, Houston 27, Tex.

Hydraulic **pump motors** are available in NEMA frames 182 through 215, nominally 1 through 5 hp. Dripproof, enclosed or explosion-proof construction is offered.—General Electric Co, Schenectady 5, N. Y.

**Portable power supply** offers 3,000 w of output power. The model (Zeus GW-300) has a permanent magnet alternator which has no brushes, slip-rings or commutator. —Western Branch, Pesco Products Div, Borg-Warner Corp, 3310 Vanowen St, Burbank, Calif.

Mechanically-held **contactors** are supplied in NEMA sizes 0 to 5, with 2, 3 or 4 poles. The Type "CRA-MH" contactors may be used where the slight ac hum of an electrically-held contactor might be objectionable. — Arrow-Hart & Hegeman Co, 103 Hawthorn St, Hartford 6, Conn.

Time-delay **relay** has two timing heads for applications where two separate times would normally be used for on-delay and off-delay operation. Each timing head has an adjustable timing range of 0.2 sec to 1 min.—Square D Co, 4041 N Richards St, Milwaukee 12, Wis.

**Cellomatic battery** automatically provides emergency ac power in the event of power failures. Five models are available with 60-cps, 100-v outputs from 40 to 150 w.—Sentry-Lite Div, Scranton Cellomatic Battery Corp, Archbald, Pa.

# Wiring Problems Explored at Conference

## National Wiring Conference attendees hear successful case histories of wiring promotion; see Look awards given

As far as utility men were concerned, successful case histories of wiring promotions highlighted the 16th Annual National Wiring Conference held in Philadelphia last month.

The Conference is conducted by the National Wiring Bureau, sponsored by five major electrical trade associations, and attended by representatives from power companies, electrical leagues, electrical contractors, manufacturers, and distributors.

Following are the highlights of some of the case histories:

C. E. Anderson, manager, sales promotion, at Virginia Electric & Power Co, noted that his company, which had actively supported Housepower since the program's inception in 1956, decided in 1959 to also concentrate its support of Housepower on the home rewiring market. This decision was reached because the utility felt the time was opportune to go after the huge existing market badly in need of better wiring.

The 1959 wiring program, termed "VEPCO's Housepower Special," had two objectives:

**1.** Bring VEPCO employees into direct participation in the company's sales efforts.

**2.** Put VEPCO authorized contractors in touch with rewiring prospects.

The principal point of the plan was to have wiring check-ups made at no cost to the customer by VEPCO authorized contractors.

Employees were brought into the plan by having them interview customers directly who were interested in having their homes rated. Cash prizes were given to those who turned in the most prospects, had them rated, and secured wiring jobs.

"A Housepower Profit Clinic," aimed at building a profitable program which would help answer the electrical contractor's five problem areas, and initiated by Long Island Lighting Co, was described by John T. Catherwood, coordinator, dealer promotions and planning. He was aided by Training Specialist Harold Lanchantin, who posed as an electrical contractor and interrupted the presentation with pertinent questions and remarks about adequate wiring.

The five things the electrical contractor needs, Catherwood said, are:

**1.** Information that will help him manage his business more efficiently

**2.** Knowledge of advertising and sales promotion so his business volume can be expanded

**3.** Additional training in personal selling to close bigger sales

**4.** Data on contractor installed products and devices that will increase prestige, and thus profits

**5.** Information to help him upgrade the electrical installations in new home construction.

The Profit Clinic was developed by the Porter Henry Co for Edison Electric Institute's Wiring Promotion Committee.

Lanchantin feels this program is ideal for utilities because the clinic offers them an opportunity to get the electrical contractors to sell electricity.

The Profit Clinic sells for $100, and consists of five 2½-hr sessions, Catherwood pointed out.

Coburn D. Hollister, general sales manager, Niagara-Mohawk Power Corp, believes in direct mail, though

(*Continued on page* 128)

**HERBERT SNEAD,** (left) Dayton P&L's adequate wiring supervisor, accepts Look award from Richard Harmel

**DUAL AWARDS** for utilities in over 250,000 meter class are accepted by C. E. Anderson (left) and K. C. Steblen

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16-page pocket-sized Application Procedures booklet for your linemen

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**DEPT. GG-4**
5349 St. Clair Avenue • Cleveland 3, Ohio

## Wiring Conference (*Continued from page* 125)

he admits it's "laziest kind of sales promotion that anybody could conduct." Effective, though, he says.

He then went on to describe a direct-mail campaign being conducted by Niagara Mohawk's three Wiring Bureaus.

The objective is to convince the builders of store and office buildings that it is essential for them to have adequate wiring when the building is 10 years old. The way to do this is to have it adequately wired when it is new, he said.

For lighting, the Bureaus' aim is to have wiring capacity for present lighting, times two. "We know this to be a conservative estimate of the customer's future needs and chances are he will need that wiring capacity even before 10 years are up," Hollister pointed out.

For air conditioning, it is to have wiring capacity sufficient to carry the present air conditioning load. The summer of 1970 won't be any hotter than that of 1960 and neither will the customers. No excess future wiring capacity for air conditioning is required, he said.

Even if air conditioning is not going to be installed when the building is built, wiring capacity should be installed for it.

### Look Awards Accepted

*Look* magazine awards for excellence in wiring promotion were accepted by three utility representatives. C. E. Anderson, sales promotion manager for Virginia Electric & Power Co, accepted for his company and K. C. Steblen, manager, Adequate Wiring Bureau of Central New York, took the one for Niagara Mohawk Power Corp. The utilities tied for first place in the over 250,000 meters class.

Herbert Snead, supervisor, adequate wiring department, Dayton Power & Light Co, accepted the one given for utilities under 250,000 meters.

The awards were presented by Richard P. Harmel, manager of markets and merchandise for *Look*.

## Ground Broken for First GE Gold Medallion Project

A 204-apartment unit total-electric development, the first major Gold Medallion development under General Electric's new Residential Market Development Operation, has been started in Palm Springs, Calif. California Electric Power Co has certified the development for a Gold Medallion award.

General Electric's RMDO is the new program designed to help coordinate and simplify the purchase of complete electrical systems for builders and provide promotion and merchandising assistance for Medallion Home projects.

At groundbreaking ceremonies, Richard L. Weiss, president of the construction company building the development, said that the home buyer's increasing awareness of total electric living was a major factor in the decision to plan the development to conform to Gold Medallion standards.

The 204 apartments will be heated and cooled with heat pumps.

## SELLING BRIEFS

**Residential outdoor light** for lighting drives, entrances, swimming pools, and recreational areas has been developed by Line Material Industries. To be used with incandescent lamps rated through 150-w, each unit has a utility outlet in the slip-fitter base. A plug-in lampholder assembly can be lifted off for lamp replacement.

Increased use of **electric heaters** helped attendance at drive-in theatres shoot up 34% in 1959's final quarter over a like 1958 period, reports the *Wall Street Journal*.

Employees of Kansas Power & Light Co are granted an **allowance** of 15¢ per sq ft of living area toward electric heat installation in their homes.

Tishman Realty & Construction Co of New York has entered the television, radio and air conditioning **leasing business** with the acquisition of Wells Television Inc, the firm which leases such equipment to hotels, motels and hospitals.

**Appliance twins,** a 24-in. built-in oven-range and a 24-in. built-in undercounter dishwasher, have been developed by Youngstown Kitchens, Oven-range is a cook-top and oven which can be installed complete in one unit, or as a separate drop-in range and built-in undercounter oven. Dishwasher fits under standard counter-top.

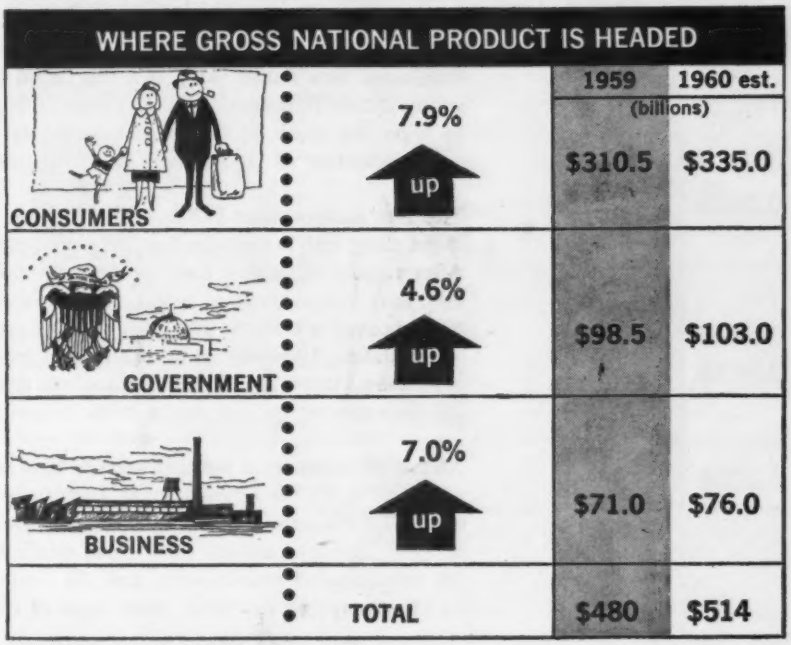
Carrier Corp will promote a new **air conditioning unit** that "goes far beyond summer cooling," with a $3.5 million ad campaign, reportedly the largest such in the industry.

Portable battery-operated transistorized **TV receiver** will go into production in April at Emerson Radio & Phonograph Corp. The 28-lb, $250 unit will have a 10-in. direct-view picture tube and can be recharged by plugging into any electrical outlet.

**Dehumidifier promotion** at United Illuminating Co (EW, Nov. 16, 1959, p 135) is being merchandised by Westinghouse Electric Corp which supplied the units for the promotion. Eight-page booklet is available to utilities from J. J. Anderson, Westinghouse, 300 Phillippi Rd, Columbus 16, Ohio.

Montana Power Co has added **decorative lighting** to its newly renovated Butte headquarters. A photoelectric cell controls the 16-unit lighting battery atop a building across the street. Twelve of the lights are 1,500-w; the others 400-w. Company officials believe installation is the most extensive outdoor building lighting in the state.

**Electric home heating** is being promoted in two residential campaigns at Sacramento Municipal Utility District this year. The first was held in January and February, and electric heating will also be part of an October through December promotion. Other campaigns include Housepower, electric ranges, freezer-refrigerators, and electric dryers.




Source: McGraw-Hill Dept. of Ecomonics

Report on
**Electrical Business Outlook**

# 1960—Still the Best Year Ever

**1960 still stacks up as the best business year in history,** despite the gloom that has been mounting. It's true that post steel strike inventory rebuilding has been disappointing—it was supposed to push 1960's first half into an all-out boom. Detroit, too, is scaling down its hopes for a 7-million-car year. But the very fact that there hasn't been a sky-high boom may be a hopeful sign of underlying strength for the nation's business, McGraw-Hill's Department of Economics believes.

Business now seems to be settling into a more leisurely—but more sustainable—pace. If the trend continues, we may be able to avoid the feast-and-famine cycles of overproduction and underconsumption that have helped throw business into recession for six years out of the past 12.

## Auto Sales—Cause for Concern?

**At the turn of the year, auto makers were talking about a 7-million-car** season. Now, they admit, these estimates were far too optimistic. But even at their present rate, auto sales will almost surely top last year's 5½ million figure—and last year was the third best in the auto industry's history. The 700,000 autos Detroit rolled out in January would have over-built dealer's inventories even if cars were selling at 7-million-a-year, which they weren't. January's output, involving costly overtime and Saturday assembly, was trimmed back quickly when cars began piling up in dealers' lots. But auto sales this year are still good. They're running about 13% ahead of 1959; in fact, both Chevrolet and Cadillac set new sales records in February. And this, by the way, was the best February

for auto sales since 1957's February peak—despite the ice and snow that covered much of the nation this year.

**Still, dealers' yards are crammed with unsold cars.** Field inventories of new autos reached 950,000 by March 1st, and now threaten to top last summer's all-time peak of 965,000 by the time the spring selling season begins. To move these cars, salesmen are promising big discounts (up to $400 or more) earlier than usual in a model year. But this "hard sell," combined with the normal spring upturn (last year, auto sales rose 20% between March and June) ought to wipe out much of the present overstock. Consumers, furthermore, show every indication of buying more new cars this year than last.

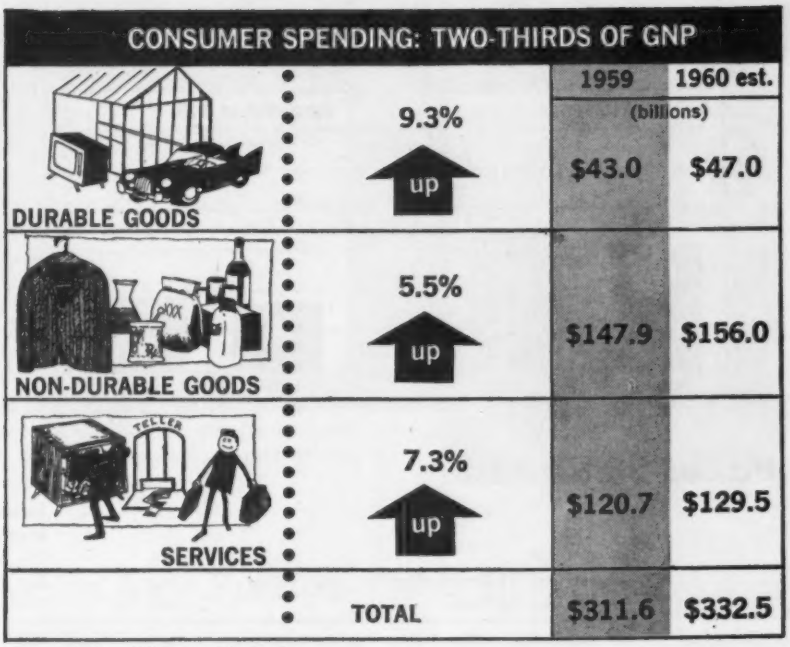
**The auto makers—and builders of most other durable goods**—are endeavoring to get along with inventories that are geared pretty closely to current production. After rapidly rebuilding their working inventories in December and January, they have settled down to a less zealous pace. This sums up fairly well what has happened to business thus far in 1960. Even without a lot of excess inventory accumulation, 1960 will set new records in gross national product and industrial production. But it also seems clear that we now have a chance to avoid a roller coaster series of ups and downs in the course of the year.

**Almost all segments of industry seem to have settled down.** The steel mills were operating at 95.7% of capacity in January (equal to a 142 million ton-a-year rate). But this pace, of course, couldn't be maintained—the all-time record, set in 1955, was 117 million tons. Now, steel's tired furnaces are shutting down for much-needed maintenance, and the output rate, which slipped to about 91.1% of capacity last week, shows signs of still further slowing.

**Ever since the year began, businessmen have been aware** there is little reason to rush in with big new orders for steel and other durable materials. With money rates as high as they are, it simply doesn't make sense for them to tie up too much cash in working inventories. If business activity follows the trend of the past, you can still count on a considerable rise in factory stocks before business levels off. But now it looks as though restocking—and business in general—will be steady and gradual, rather than concentrated in the first half.

**Of course, there is still a chance that business will catch spring-fever.** It never seems likely as we drag through January and February, but pleasant weather eventually arrives. And if the result is a surge of auto sales for spring driving, and television sets for watching the ball games, the present conservative mood of businessmen may vanish with winter's chill. We may yet see a delayed rush to build up inventories at a $9-10 billion-a-year rate. And there is some indication that we may see some hastily conceived new plans to expand plant capacity. But if spring does not bring about this touch of seasonal madness, we shall have to reconcile ourselves to a 1960 level of business that is merely the best ever.

**As one key indicator, personal income—now at a rate of $395 billion**—will rise this year to a high of $415 billion or more by year-end, McGraw-Hill's Economics Department predicts. This extra pocket-cash will easily finance a new splurge of consumer spending, up from $323 billion currently, to $340 billion by the end of this year. And that is not all. Consumers are saving less and buying more, as the latest Department of Commerce figures indicate. Although sales of durable goods usually account for about 15% of consumer purchases, last year they accounted for about 30%. This is characteristic of consumer spending during periods of rising business. Furthermore, personal mortgages and installment credit expanded $18 billion last year—well above the $10 billion-a-year rate of the last decade. Consumer spending accounts for two-thirds of our GNP. Hence, with personal income and spending at all-time highs, it seems clear that business activity generally will rise throughout 1960.



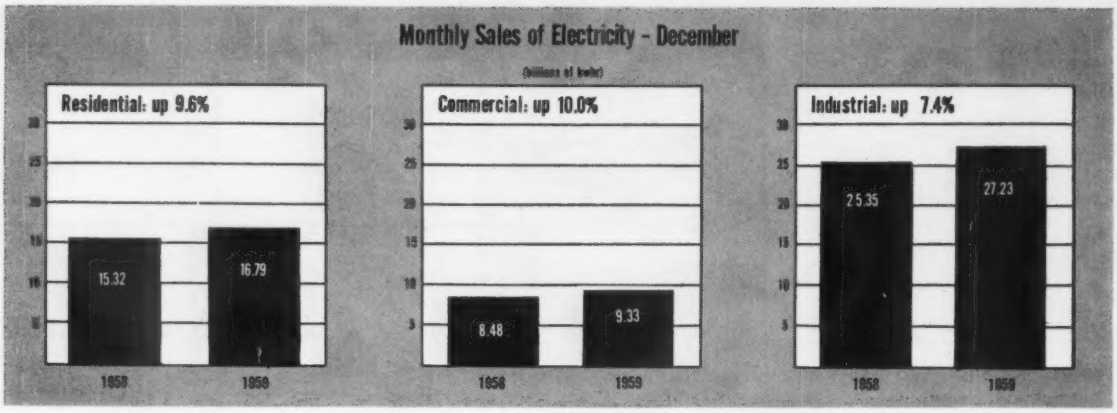

Source: McGraw-Hill Dept. of Ecomonics

**However, a rising level of business in 1960 does not,** in all likelihood, mean much in the way of rising prices. Costs are rising in many industries, and wherever buyer demand is strong enough, price increases are sure to follow. But in most lines of manufacturing capacity is so ample, and competition so keen, that a price boost of more than token dimensions simply can't be put across. Accordingly, the rise in consumer spending probably won't be followed by a sharp rise in the cost of living. Instead, it should give rise to continued bargains for the shopper. And as far as autos are concerned, any expansion of sales to the 7 million mark now seems to depend on putting out more compacts (now about 25% of new car production) or on still bigger price cuts on the standard models.

**All of this is good for the consumer, but poses big difficulties** in the way of making large profits. And this seems to be what is really worrying Wall Street—the fact that the 1960's may not bring forth the same large profit margins that blossomed in 1955-56. Without inflated prices or profit margins, it's unlikely the market will launch a sustained climb this year. Instead, it seems to have readjusted to less speculative price-earnings ratios that make more sense, historically. But this, in itself, is no tragic portend for business. The nation's industry can get along very well without the periodic shocks to confidence from a boom-and-bust stock market.

**Possibly, the simmering down of the stock market may even help business** indirectly. As less money is attracted to speculation, more may pile up in savings institutions, increasing the funds available for construction. Hence, the outlook for new private construction is likely to improve as the year goes on. In fact, it already seems clear the period of increasing tightness is about over.

**All these developments put business in 1960 on a more sustainable footing** than before. The outlook for this year is still bright—extremely so. And many economists believe it's now far brighter for 1961 and the years beyond than if business had tried to cram too much growth into too short a period.




## Power Statistics

| | | Latest Month | Year Ago | Annual Change % |
|---|---|---|---|---|
| Capacity | Dec. | 156.62 | 142.60 | 9.8 |
| Est. Dec. '59 Peak (million kw) | Dec. | 124.7 | 125.7 | −0.8 |
| Est. Dec. '60 Peak | Dec. | 134.0 | 135.0 | −0.7 |
| Production—billion kwhr | Dec. | 63.11 | 59.24 | 6.5 |
| Hydro | | 12.68 | 10.75 | 18.0 |
| Fuel | | 50.43 | 48.46 | 4.1 |
| Sales—billion kwhr | Dec. | 56.31 | 52.02 | 8.2 |
| Residential | | 16.79 | 15.32 | 9.6 |
| Commercial | | 9.33 | 8.48 | 10.0 |
| Industrial | | 27.23 | 25.35 | 7.4 |
| Other | | 2.96 | 2.87 | 3.1 |
| Fuel Consumption | Dec. | | | |
| Coal—million tons | | 15.45 | 15.98 | −3.3 |
| Oil—million barrels | | 9.37 | 9.23 | 1.5 |
| Gas—billion cu ft | | 113.74 | 90.07 | 26.3 |
| Net Income Class A & B Co's—$ million | Dec. | 162.00 | 152.48 | 6.2 |
| Residential Customers—millions | 12 mos. | 48.97 | 47.79 | 2.5 |
| Revenue per kwhr | ended | 2.50¢ | 2.53¢ | −1.2 |
| Avg kwhr per customer | Dec. 31 | 3,585 | 3,366 | 6.5 |
| Avg annual bill | | $89.63 | $85.16 | 5.2 |

## Business Statistics

| | | | | |
|---|---|---|---|---|
| Indexes: 1947–49 = 100 | | | | |
| FRB Industrial Production | Jan. | 169 | 152 | 11.2 |
| ENR Construction Cost | Mar. | 170.5 | 163.8 | 4.1 |
| BLS Cost-of-living | Jan. | 125.4 | 123.8 | −1.3 |
| New Orders for Machinery (1950 = 100) | Jan. | 171 | 157 | 8.9 |
| NEMA Sales | | | | |
| Insulation materials | Dec. | 154 | 124 | 24.2 |
| Electric appliances | | 87 | 95 | −8.4 |
| Wholesale prices | | | | |
| Motors and generators | Dec. | 144.7 | 146.0 | −0.9 |
| Transformers and regulators | | 146.8 | 148.8 | −1.3 |
| Switchgear and fuses | | 178.1 | 172.0 | 3.5 |
| GNP—annual rate—$ billion | 4th qtr. | 483.5 | 457.1 | 5.8 |

**Significant changes:** NEMA's index of insulation sales, although running more than 24% ahead of 1958 figures, is nevertheless moving within the general range established in the comparable months of 1956. Generally lower food prices have depressed the cost of living index under year-ago levels.

# Schneider Is VP-Operations

F. J. Schneider has been elected vice president in charge of operations for Niagara Mohawk Power Corp. He had been superintendent of operations for the company's Western Division.

Schneider will direct all electric and gas operations of the Niagara Mohawk System and will have his headquarters at Syracuse. He succeeds J. Leo Welch who died on February 10.

In 1933, Schneider began his career with Niagara Mohawk as a foreman in the construction department at Fulton, N. Y.

He was named assistant operating superintendent of the Central Division in 1954 and general superintendent of operations two years later. In 1958, he was appointed general superintendent of operations for the Western Division, with headquarters in Buffalo.

## Brewer-Titchener Names New President and Two VPs

Brewer-Titchener Corp has named Edward R. Brewer president. Harold J. Flinn was made executive vice president, and William S. Brewer, vice president for finance. and secretary. Edward Brewer succeeds the late James H. Greene. Newman Pearsall has been elected chairman of the board.

Edward Brewer first worked in an engineering and production supervisory capacity for Brewer-Titchener's Cortland Carriage Goods Division for several years. He was elected secretary in 1949, a director in 1952, and held the post of vice president since 1954.

E. R. BREWER FLINN W. S. BREWER

Flinn will have direct general management responsibility for all operations of the company and its Manufacturing and Sales Divisions. He joined the company in 1953 as controller, was elected treasurer in 1954, and became a director in 1958.

William Brewer was elected a director in 1949, a vice president in 1954 and has served as purchasing agent for many years.

## Buck and Somerville Promoted to New Positions at UI

Floyd W. Buck has been promoted to engineering manager, and Eugene W. Somerville to general superintendent, of United Illuminating Co.

Buck will be in charge of the design and construction of the company's power production, transmission and distribution systems, and other technical services of the engineering department. Until his present promotion, he was superintendent of engineering for 10 years.

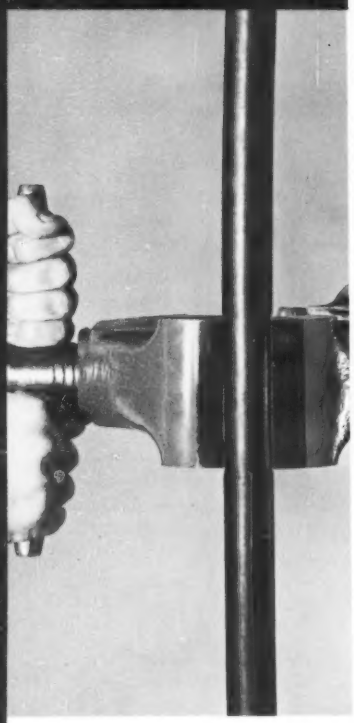
Somerville will be responsible for the operation and maintenance of UI's power production, transmission and distribution systems. He was superintendent of operations.

Joining the company in 1942 as a test engineer in the production department, he has also been supervisor of operations for the Steel Point power plant.

BUCK SOMERVILLE

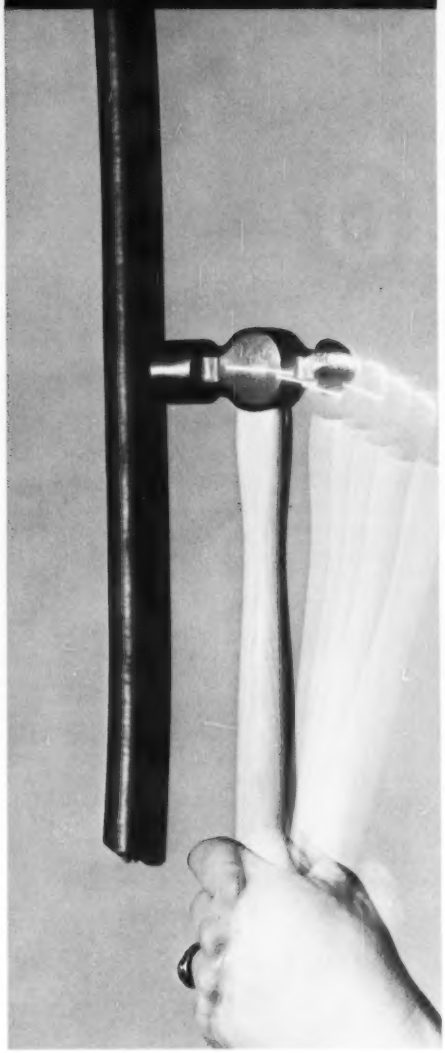
(*More News About People on page* 136)

## Neoprene resists
## COLD FLOW



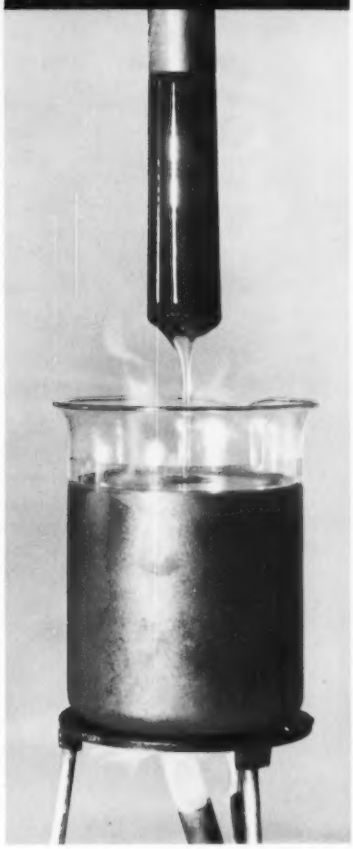
In laboratory tests and on the job, neoprene synthetic rubber has proved its ability to resist permanent deformation under load. It stays tough, resilient at high and low temperatures. Other cable jacketing materials get brittle when cold, soften when heated, flow when compressed. Not neoprene.

## Neoprene resists
## IMPACT



Neoprene is a tough, resilient jacketing that can take impact and abuse. In the most severe mining service it has proved its ability to withstand abrasion . . . to resist gouging and tearing. It surpasses other cable jacketing materials in laboratory impact tests. It gives your cable the best protection available against abuse.

## Neoprene resists
## HEAT . . . OIL



Neoprene jacketing resists exposure to oil, grease and a variety of chemicals and solvents. Its resistance to heat protects insulation at temperatures as high as 250° F. In addition, neoprene is flame resistant; it will not support combustion, an important factor among safety-conscious cable users in factories, refineries and mines.

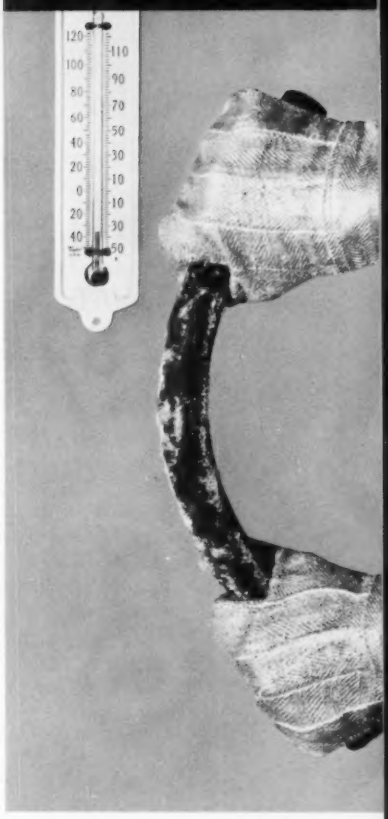
Neoprene resists

## SUNLIGHT...WEATHER

Installed January 6, 1935, these two test lengths of electrical cable have been exposed out of doors to rain, snow, sun, ozone and industrial fumes for over a quarter century. One jacketed with ordinary rubber (right) is badly cracked, furrowed, embrittled. But the neoprene jacket (left) is still sound, tough, resilient—still able to give complete protection to the cable.

Neoprene resists

## SUB-ZERO COLD



In the arctic, neoprene synthetic rubber is used to protect radar domes—and you can use this cold weather durability in cable that must serve outdoors in frigid winter weather. Neoprene jacketing stays flexible and resilient at low temperatures ... successfully meets specifications for military cable designed for use at –65° F.

# PROVED

## IN A QUARTER CENTURY OF INDUSTRIAL SERVICE —THERE'S NO DOUBT ABOUT NEOPRENE JACKETING

For more information, write to: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EW-3, Wilmington 98, Delaware.

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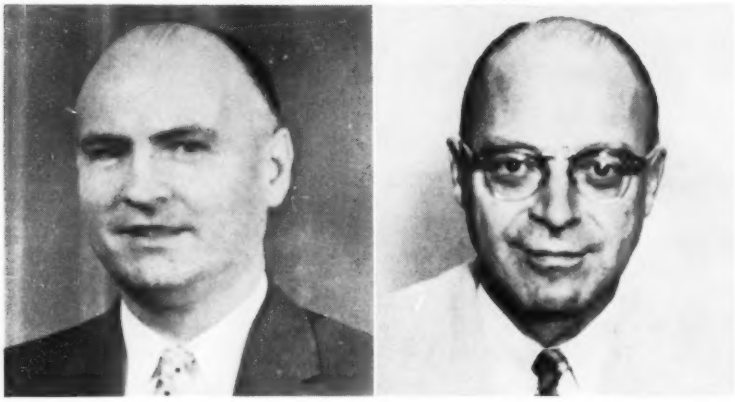
**NEOPRENE**
**SYNTHETIC RUBBER**

Better Things for Better Living . . . *through Chemistry*

## Siler, Frizzell Named Lighting Firm Vice Presidents

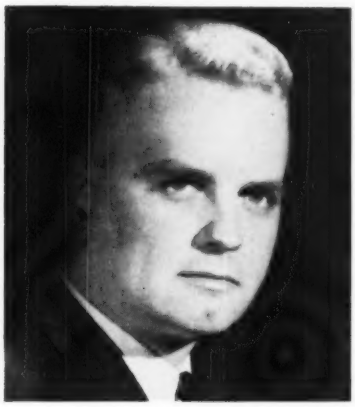


Pittsburgh Reflector Co has named Harold Siler (left) and John S. Frizzell (right) vice presidents. Siler will direct all the sales activities of the company; Frizzell will have direction of all engineering and sales promotion activities.

Siler has been with Pittsburgh Reflector for 20 years, and prior to his present assignment served as chief engineer. Frizzell was employed by West Penn Power Co before joining the lighting firm.

Both have served as chairmen of various Illuminating Engineering Society committees.

## FPE Appoints Director of Utility Sales



Lewis H. Walke has been appointed director of utility sales for Federal Pacific Electric Co. He will have staff responsibility for all company marketing activities in the utility sales field.

Walke comes to Federal Pacific from Allis-Chalmers Mfg Co, where he served successively as switchgear applications engineer in Milwaukee, field engineer in Cleveland, and manager of utility sales for the Pittsburgh office.

Before that he was with Virginia Electric Power Co as a transmission and distribution specialist.

In 1950 and 1951 he saw service with the National Production Authority's Power Equipment Division.

### *PERSONAL BRIEFS*

**Alfred J. Hart** has been appointed advertising supervisor for American Electric Power Service Corp. He will head the advertising section of the Service Corp's public relations department.

**R. M. Bibbs** is the new administration manager of British Columbia Electric Co's Electrical Division.

Cincinnati Gas & Electric Co has given expanded duties to **J. Reed Hartman,** vice president. He will assume responsibility for the following departments: Community relations, electric sales, customer service, advertising and media services, and sales promotion. At the same time, **Robert W. Neel** has been named manager of the electric sales department.

**William F. Gilfillan Jr** has been appointed director, advertising and public relations, at Duquesne Light Co.

Delaware Power & Light Co's advertising manager, **John E. Cooper Jr,** has been given the first annual silver award of the Advertising Club of Wilmington, Del., based on his contributions to the company, his creative ability, contributions to the general advancement of advertising and his personal qualifications.

**Robert F. Ritchie,** president and chairman of the board of Arkansas Power & Light Co, and **Gerald L. Andrus,** president, New Orleans Public Service, Inc, have been elected to the board of directors of Middle South Utilities, Inc.

**Thomas J. Galligan Jr,** vice president and assistant to the president of Boston Edison Co, has been elected to the board of directors.

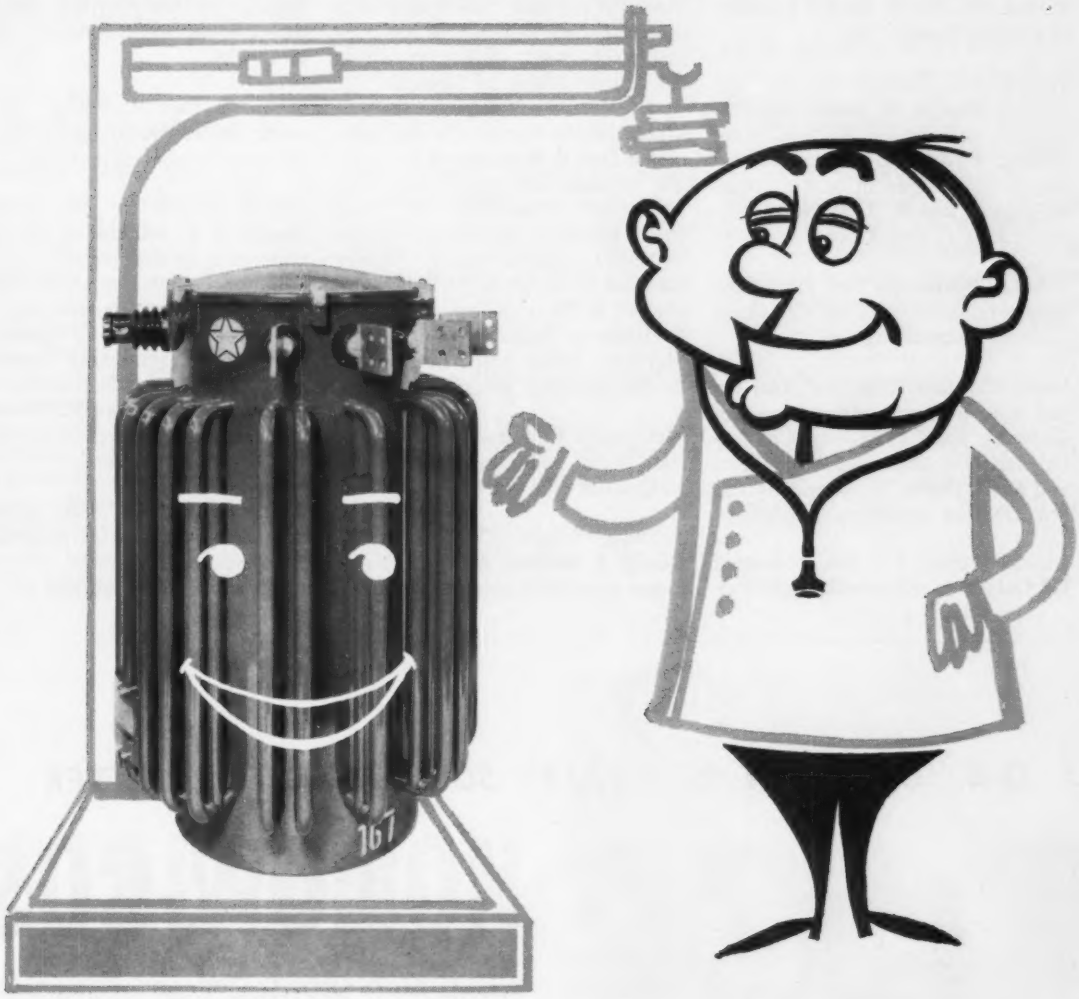
Northwestern Public Service Co has named **E. H. Dunker** the new manager of the Aberdeen Division.

Green Mountain Power Corp has elected **John F. Sturtzenburger** clerk and treasurer. He succeeds the late **Daniel R. Casey. George A. Carlson** was named assistant treasurer to succeed Sturzenburger.

**John R. Teerink** has been named head of the California department of water resources' Southern California district office.

(*More News About People, p* 138)

# 167-kva Featherweight Pole Star® now weighs in at 1350 lbs.




## More power per pound than ever before in a 167-kva distribution transformer

After having "weighed in" at approximately 1500 pounds when introduced in 1953, Pennsylvania's 167-kva Featherweight Pole Star Transformer has been steadily reducing . . . to 1425 pounds in 1956 . . . and now, all the way down to *1350 pounds*. This new low weight for a 167-kva transformer means easier handling, and easier, less costly installation.

In addition to the pounds and installation costs that it saves, the latest weight reduction is noteworthy in that it once again demonstrates the *continuous nature* of Pennsylvania's program of product improvement. The accomplishment of being the first manufacturer to break the "100-kva barrier" on pole mounting has been but one step in the search for ways and means of providing the nation's utilities with more power per pole. In addition to periodic weight reductions, the program has resulted in 250 and 333-kva Featherweights for pole or platform installation. The next step is a lightweight 500-kva transformer, for which preliminary designs already are in progress.

Featherweight Pole Star 167's are being used singly or in clusters at new shopping centers, in existing areas in which power needs have multiplied, and in other applications calling for the maximum power per pole. For information regarding the 167 and other Pole Star Featherweights—all available through 15 kv—contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW-EDISON

**PENNSYLVANIA DISTRIBUTION TRANSFORMERS**

**Walter Croft,** consulting engineer for Arizona Public Service Co, has been chosen Arizona professional engineer for the month of February.

**James L. Shoemaker** has been named director of market research at Florida Power Corp.

Philadelphia Electric Co has appointed **Donald R. Jones,** superintendent, Cromby electric generating station; **Edward G. Boyer Jr,** assistant superintendent of the Cromby station; and **R. J. McNulty,** acting manager, Frankford district.

**John J. Borkowski** has joined the public relations staff of Cleveland Electric Illuminating Co.

South Carolina Electric & Gas Co has named **Percy Miley,** assistant secretary; **John T. Mundy,** Charleston Division commercial manager; and **L. O. Darby,** assistant Charleston Division commercial manager.

Illinois Power Co has promoted **Ed Galassi** to commercial sales representative at the LaSalle office, and **Robert J. Bugsen** to adequate wiring advisor. In the Champaign office, **John Andrews** has been made adequate wiring advisor, and **Gene Brown,** commercial sales representative; while in Galesburg, **Lewis Powell** is the new commercial sales representative. **Don Hynds** has been made supervisor of key punch at the general offices in Decatur.

Monongahela Power Co has promoted **Don P. Rodeheaver** to assistant transmission and distribution supervisor, Fairmont, W. Va.; **Bruce Ferrell** to the Elkins Division as T&D superintendent; **Worley Gardner** to assistant T&D superintendent in Morgantown; and **Henry E. Hupp** to manager of the West Maryland power properties, part of the Morgantown Division.

**Mrs. Helen C. Eaton,** Ashland district home supervisor, has retired at Kentucky Power Co.

Potomac Edison Co has named **George T. Sanders,** manager of customer marketing services; **John W. Geoghegan,** manager of merchandise sales; and **C. Frank Anderson,** sales supervisor of the Waynesboro district.

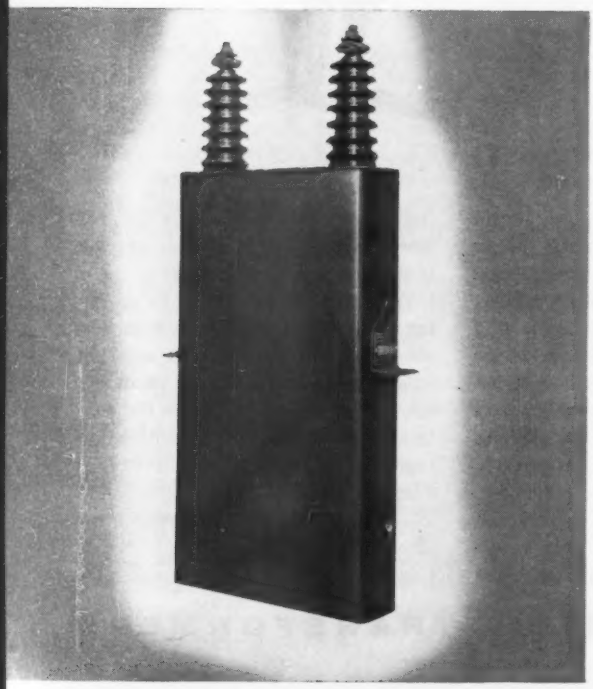
The U. S. Senate has approved the reappointment of former **Rep Brooks Hayes,** D. Ark., to the board of directors of the Tennessee Valley Authority.

Southern Canada Power Co has made **Julien Burns** agronomist in the merchandise department.

Union Electric Co has promoted **Harold S. F. Schmidt** to estimating supervisor in transmission and distribution engineering; **John Markovich Jr,** foreman, maintenance and construction; **Edwin C. Giesler,** supervisor of engineering records in transmission and distribution engineering; and **Wallace E. Wendland** to senior assistant engineer in the Construction Division.

**J. J. Kenney** has been named a special assistant to the president of International Business Machines Corp. **J. Clinton Abrams** has suc-


## G-E "COMPACT ISOKRAFT* 50" CAPACITORS OFFER



# LOW-COST

"COMPACT ISOKRAFT 50" Capacitors now weigh only 82 pounds—the smallest, lightest 50-kvar units on the market today. The 17 percent weight reduction and 20 percent volume reduction from the General Electric "ISOKRAFT 50" unit, introduced in 1959, mean faster, easier installation of individual units or equipments. And reduced installation time means lower installation cost.

One lineman can bring the new "COMPACT ISOKRAFT 50" capacitor to the base of a pole while his partners make other preparations for installing the unit in a hanger or in an existing pole-type equipment. Hand holes in the unit carton facilitate easy handling of boxed units in warehouses and in transit to the installation.

*Trademark of General Electric Co.

ceeded him as director of service on the corporate staff.

**William N. Lucke** has joined Philco Corp's Government and Industrial Division as systems manager with responsibility for the planning and development of electronic data communications, display and processing systems.

Reynolds Metals Co has promoted **Joel Denton** to power manager.

**J. Walter Nelson** has been appointed sales manager of the Mobile Home Heating Division of Ramco Manufacturing and Engineering Co.

Westinghouse Electric Corp has named **Owen L. Taylor** engineering manager, and **C. W. Paulson** marketing manager of the Portable Appliance Division. **Edward T. Adams** has been appointed manager of Rayescent engineering for the Lamp Division. **Frederick L. Graf,** sales manager, switchgear department, has been named adviser to the director, Electrical Equipment Division, Business and Defense Services Administration, U. S. Department of Commerce. **Dr S. W. Herwald,** vice president-research, has been named a Fellow of the Institute of Radio Engineers.

**John W. Kalb** has been made a Fellow in the American Institute of Electrical Engineers. He is director of research at the Ohio Brass Co's Barberton, Ohio, High Voltage Laboratory.

Radio Corp of America has named **Norman Caplan** to head industrial electronic products activity in the Washington-Canonsburg, Pa., area. **Clifford H. Lane** has been appointed manager, industrial semiconductor products department. **Fred R. Raach** has been made staff vice president, management engineering.

**D. Richardson Ingman** has been appointed street lighting engineer for Line Material Industries.

**Eleanor Adams** has been appointed home equipment editor of the *New York Herald Tribune.*

**Robert H. Barclay,** consulting engineer, has been chosen one of twelve distinguished alumni of Washington University of St. Louis to receive the Alumni Citation in recognition of outstanding achievements and services which reflect honor upon the university.

**G. W. Swanson,** former head of the Station Plans Division of Consumers Power Co, has joined Commonwealth Associates and is now in Korea where the company is a member of a consortium making economic and feasibility studies under a contract with the International Cooperation Administration and the Republic of Korea. Swanson is head of the power department. It was incorrectly reported in the Electrical World, Jan. 11, 1960, that Swanson had retired.

**Thurman L. Rundlett** is chief engineer of Anderson Electric Corp, not Line Material Industries, as reported in Electrical World, Feb. 15, 1960.

(*More News About People, p* 140)


# INSTALLATION

Further improvements in ISOKRAFT* paper dielectric and refinements in quality control and manufacturing techniques have made this capacitor possible. The new unit utilizes the lower, flatter watts loss characteristic and high dielectric strength of the ISOKRAFT paper.

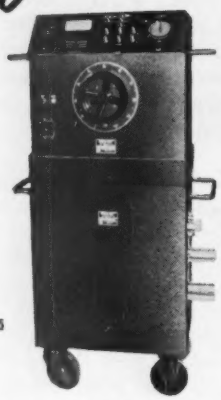
*For complete information contact your G-E Apparatus Sales Representative, or write for bulletin GEA-7061, General Electric Co., Section 445-31, Schenectady 5, N. Y.*

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

**New**

**CIRCUIT BREAKER TESTERS**



MODEL 3075
7.5 Kva

designed for field or shop testing . . . quickly, safely, and accurately by semi-skilled personnel . . .

Ammeter, Timer, Power Source (With High Overload Capacity) Give High-Current (Low-Voltage) Verification of Time Current Curves. Units Compact . . . Portable, continuously adjustable.

Ratings 1 thru 75 kva or Ratings to Meet Your Specific Requirements.

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**DISTRIBUTION TRANSFORMER TESTERS**

MODEL TTS-250

Distribution transformers up to 250 kva capacity can be accurately tested with new MULTI-AMP Transformer Test Sets. Units may be used with all transformers having primary winding ratings of 2.4 to 15 kv and secondaries rated 120/240 v. Makes six measurements including primary voltages, exciting currents, no-load loss, high voltage output, polarity and ratio.

Standard models available to test transformers from 25 kva to 250 kva.

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## SALES ASSIGNMENTS

### COMPANY STAFFS

**Line Material Industries,** McGraw-Edison Co subsidiary, has made the following sales engineering staff changes: J. R. Murray has assumed field engineering duties in the Omaha, Neb., area; M. L. Fennig has succeeded Murray as field engineer at the Milwaukee office; R. W. Kelly has become supervisor of sales and service for protective equipment products; F. P. Elam has taken over field engineering duties at Birmingham, Ala.

**Continental-Diamond Fibre Corp,** The Budd Co subsidiary, has promoted Harold Moyer to field sales manager.

**Pennsylvania Transformer Division,** McGraw-Edison Co, has opened a branch sales office in Chattanooga, Tenn. Edmond P. Zimsky is the manager of the office.

**Allis Chalmers Manufacturing Co** has named Paul A. Dimberg, manager of utility sales, and Hugh C. Blair, manager of industrial sales, in the New Orleans district.

### REPRESENTATIVES

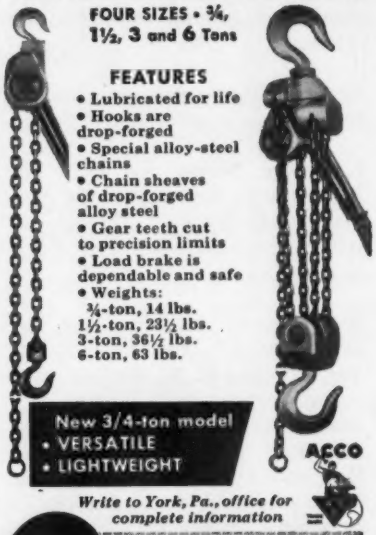
**Subox, Inc,** has appointed Fred H. Carlson Co, Seattle, Wash., and Butte, Mont., sales representatives for Washington, Montana and northern Idaho.

**Combustion Engineering, Inc,** has terminated its sales agency agreement with T. C. Heyward & Co, Charlotte, N. C., and Jacksonville, Fla.

**Radio Corp of America** has appointed these firms as manufacturer's representatives for mobile communications equipment: Texas Gulf Electronics, Inc, Houston, Texas; Leslie E. Olsen Co, Lewistown, Mont.; Communications Sales Co, Salisbury, Md.; and Industrial Communications of Indiana, Indianapolis.

**Pfaff & Kendall** has named Matt Cabot representative in Hawaii. He was formerly western sales manager for Day Brite.


**NEW 3/4-ton Pull-A-Way**
**Added to WRIGHT TYPE "C" LINE!**



FOUR SIZES • ¾, 1½, 3 and 6 Tons

**FEATURES**
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- Hooks are drop-forged
- Special alloy-steel chains
- Chain sheaves of drop-forged alloy steel
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- Weights:
  ¾-ton, 14 lbs.
  1½-ton, 23½ lbs.
  3-ton, 36½ lbs.
  6-ton, 63 lbs.

New 3/4-ton model
• VERSATILE
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**. . . the $6 you save —Is it worth it?**

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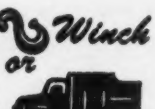
Your name, residence address, title, and company on a post card will bring 52 weekly issues of Electrical World directly to your home. You can pay the $6 later. Address: Electrical World, Dept. H-2, 330 W. 42 St., New York 36, N. Y.

*Whether a* Winch *Line Hook or a complete Line Body check your requirements with*



**UTILITY TOOL & BODY CO.**
**CLINTONVILLE, WISCONSIN**
UT-BCo

## Letters

(*Continued from page 5*)

equipment. I feel that this is a desirable kind of load which deserves greater sales effort.

It also deserves greater research effort and up-grading of personnel.

Our industry has more to offer than any other in the battle to keep American agriculture free and profitable. Your interest is gratifying.

William C. Wenner, Director
Inter-Industry Farm Electric Utilization Council, Inc

▶ Mr. Wenner is also manager of the Northwestern Cooperative Association.

To the Editor:

I read with interest your editorial comment of February 22nd in which you pointed out the importance of cooperation between electric utilities and rural electric cooperative on the local level in the promotion of farm electric applications.

In Kansas, you will find wholehearted support for this viewpoint because this is exactly what has been happening since 1954. We have a substantial amount of evidence to support such an approach. You will be interested to know that the executive director of the Kansas Electric Cooperatives (the statewide in Kansas) informed me yesterday that he was so pleased with this editorial that he plans to send a copy to each member of his Board, which includes a representative from each of the electric cooperatives in the state. He viewed it as an endorsement of the attitude of the cooperatives in Kansas.

This coordinated program in Kansas is activated through, what we term, the Kansas Farm Electrification Council—first established in August of 1954. It is not a formal organization; it has no charter, constitution, bi-laws, or any specific dues. The council consists of five members—two representing the electric companies, two the electric cooperatives, and one the Extension Service at Kansas State University. . . .

This simple form of organization has enabled the Council to secure the cooperation of a vast number of allies selected from time to time, depending upon the specific activity which was underway. . . . It would be impossible to outline in detail in a letter the activities of the Council. . . .

H. S. Hinrichs
Director of Community Service
The Kansas Power & Light Co
Topeka, Kansas


It would take you over three months to walk past Harper's complete stock of **corrosion-resistant fastenings...**

Harper manufactures and maintains the world's largest stock of standard and non-standard fasteners in Stainless Steel, Brass, Monel, Silicon Bronze, Naval Bronze, Aluminum, Copper, Titanium, and other corrosion-resistant alloys. Harper's operation is complete—from elements, billets and extruding to rolling and fabricating parts—uniform quality control that assures you of the finest parts that money can buy, yet includes the economies that only an integrated operation can realize. This is another important difference that separates Harper from other fastener companies all over the world. Harper distributors everywhere maintain complete stocks for immediate delivery. See your Yellow Pages.

Write for your free copy of new, factual, informative 24-page "CORROSION GUIDE."



THE H. M. HARPER COMPANY
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ANOTHER BIG HARPER
Difference!

HARPER

## Off-Peak Heat Storage (*Continued from page 79*)

pleasing appearance, even in the corridors.

The lobby, library, meeting rooms, and other special areas have individual lighting designs. A cross-section of lighting fixtures, with various types of diffusers, provide a working demonstration of modern lighting for customers, architects, and builders. With the lights near the windows left on at night, the three continuous bands of light around the building provide an effective but esthetic display for motorists on nearby highways.

The all-electric cafeteria, Fig 6, which will also be used to demonstrate modern food service facilities to commercial and industrial customers, has an incandescent system, with automatic motor-driven dimmers. Supplementary lighting, of a modified theatrical type, is used to produce dramatic effects on a portable stage and dramatize cooking equipment during demonstrations.

Power, water, and drain facilities, concealed behind double doors in the center of the cafeteria, simplify equipment demonstrations. Total electrical load in the cafeteria, not counting air conditioning and lighting, is 161.8 kw. This includes 97.4 kw for cooking equipment, 62 kw for water heating, and 2.4 kw for refrigeration.

# New Fuel Discoveries Help Europe's Supply

*McGraw-Hill World News*—After a fresh look at the Western European energy picture, the Organization for European Economic Cooperation has predicted that the region is likely to be up to its ears in fuels through 1975.

The outlook results from new crude oil and natural gas discoveries in recent years in the Sahara and elsewhere. It is a far cry from a chronic energy gap foreseen by OEEC's Hartley Commission in 1956.

The new look was taken by nine experts who predict OEEC demand for primary energy will rise by 25 to 30% between 1955 and 1965, and by 58 to 83% between 1955 and 1975. In terms of coal equivalent, this means a hike from 777-million tons in 1955 and 810-million tons in 1958 to 970-1,050-million tons in 1965 and 1,225-1,425-million tons in 1975.

The OEEC nations should stop favoring uneconomic home fuel production for security reasons and allow free flow of low cost energy to consumers, the experts reported. Even nuclear energy, they suggest may not be worth planned investments. Fair competition among different fuels was emphasized.

A continually shrinking market for coal was foreseen. Oil—which supplied 25% of OEEC energy consumption in 1958—will cover 35-39% by 1975. Natural gas is expected to bring a big change in the European energy picture. It could represent some 10% of the total energy consumption in 1975, the OEEC experts believe. Nearly two-thirds of western Europe's hydro potential will be tapped by 1975, compared with one-quarter in 1955. Nuclear power construction and fuel costs will drop faster than those of conventional thermal stations, the report predicted. It will become competitive toward 1970-75.

The report estimates that it will take about $130 to $140 billion, at 1955 prices, to cover the region's energy needs in the 1955-75 period.

## Texas Will Pay Cost of Utility Highway Moves

Reversing what has seemed like a trend, the Texas Highway Commission will begin paying cities and private utilities for relocating utility lines on interstate highways.

The Commission revised its policy on payment after the cities of Dallas and Austin, and private companies, won a test case in court. The Legislature had authorized the payment to utilities but the law was challenged by Will Wilson, attorney general, on constitutional grounds.

Federal funds pay 90% of the cost and the state pays the remainder.


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# TVA Organizes for First Bond Financing

Anticipating its first issue of revenue bonds after July 1, the Tennessee Valley Authority has established a power financing staff that will operate under the direction of G. O. Wessenauer.

TVA Director Arnold R. Jones will present the first bond issue before the municipal forum in New York City. The meeting date is tentatively set for May 12.

A steam plant under construction at Paradise, Ky., is the first project the federal agency is financing through bond sales. It is to cost about $100 million. TVA is authorized to issue up to $750 million of revenue bonds under Act of 1959.

Another steam electric generating station being planned by TVA for construction next year may be built on the Cumberland River, though this is only one of several sites being considered. At any rate the plant will probably be in the eastern part of the TVA system.

According to the Corps of Engineers, construction of a major plant in any area other than the upper Cumberland site would involve building a new dam to impound cooling water.

In the meantime, TVA officials and representatives of Memphis Light, Gas & Water Division are discussing a possible new power buying agreement that would permit exchanges of power during the different seasonal peaks of the two systems.

### Load Growth Report

TVA established a new record peak load of 9,586,000 kw in the hour ending 7 pm, cst, on Jan.22.

The area average temperature of about 20 degrees was approximately 10 degrees higher than the peak load hour of 1959. As a result, heating loads were about 400,000 kw less than for the 1959 peak.

Industrial loads were off by 150,000 kw as a result of strikes at plants of large industrial customers which TVA serves directly.

The TVA generating plants reached 9,746,000 kw during the peak load hour, of which 160,000 kw went to neighboring interconnected power systems. Total production for the 24-hr period ending at midnight, Jan. 22, was 208,162,000 kwhr, also a new record.

The 1959 peak occurred on Jan. 6 with a load of 9,702,000 kw, of which 327,000 kw was required by the City of Memphis. The peak 1959 production was 208,768,000 kwhr, of which 7,166,000 kwhr was delivered to Memphis, making the TVA net 201,602,000 kwhr.

## Yankee Tops Entries In Massachusetts Contest

The Great Barrington, Mass., Quota Club has awarded Katrina Juhola first prize for original hat design. A legal secretary in a Greenfield law firm, Mrs. Juhola topped all entries by blending a hat box top, rubber ball, lead pencils, sawdust, white paint, shoe polish and glue. Yankee Atomic Electric Co, builder of the 145-Mw Rowe plant, has denied rumors that her prize consisted of a year's supply of electricity.

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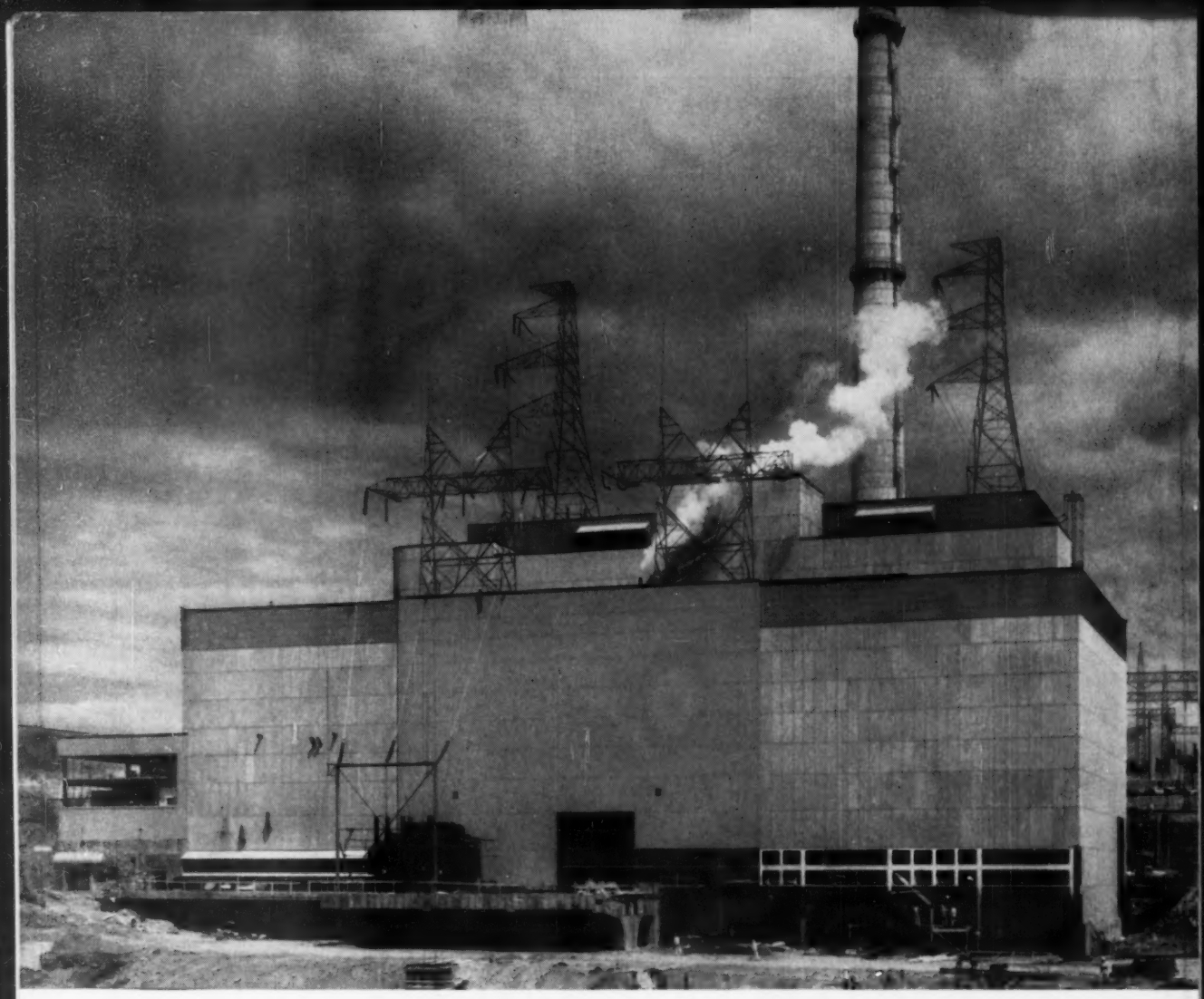

# PEPCO DICKERSON #1 ON THE LINE: UNIT #2 COMING SOON

Unit #1 of the new Dickerson Station of Potomac Electric Power Company went on the line in June 1959. A second duplicate unit is scheduled for service in early 1960. This modern station was designed and constructed by Stone & Webster Engineering Corporation in conjunction with the Engineering Departments of PEPCO. Major fluid handling equipment furnished by Worthington includes the condensers, circulating water and condensate pumps, rotative dry vacuum pumps, boiler feed and booster pumps, and main deaerators to supplement condenser deaeration in protecting the boilers and feed cycle.

The fluid handling equipment for each unit incorporates a number of special features. Included is the power-saving technique of a single full capacity boiler feed pump driven from the main turbine generator shaft through a variable speed coupling, with a spare turbine driven feed pump. Use of booster pumps also permitted mounting the main deaerator on the turbine room floor, thus minimizing cost of supporting structure and piping.

The condenser serving each unit is 110,000 sq. ft. two-pass, of special construction for maximum deaeration. It is rigidly mounted with rubber belt-type expansion joint in the turbine exhaust connection, and equipped with built-in reverse flow valves for periodic backwashing. The separate screenhouse at the river contains four circulating water pumps of vertical single suction volute MIXFLO dry pit type, driven by two-speed induction motors, supplying 95,000 gpm to each unit.

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